RAILROAD GAZETTE

FRIDAY, MAY 24, 1895.

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The Practical Use of Transition Curves.

With the object of ascertaining to what extent the railroads of the country are utilizing the numerous systems of transition curves that have been proposed, a circular was sent to the chief engineers of some of the leading railroads of the country, requesting answers to several questions on the subject. Answers were received from eighteen railroads representing nearly one-third of the railroad mileage of the country and considerably over one-third of the gross earnings. These answers may thus be taken as fairly representative of the practice of the country. The questions are here given in full, accompanied by comments or abstracts of the answers received.

1*st. Do you use transition curves?* About three-fourths of the answers received reported the use of regular systems of transition curves. Of the others some reported the occasional use in special cases. One such answer was from a road that is remarkable for its easy alignment and on this account the necessity for transition curves has never been urgent. The answers from two prominent roads that do not use them will be discussed later.

2. *Do you follow any of the published systems (Searles, Crandall, Wellington, etc.)? If not, will you state briefly the mathematical character of the curve used.* The answers were almost as varied as the number of them, but it was not difficult to classify them into three general systems. The C., C., C. & St. L. uses the Holbrook spiral, a system based on the "true transition curve," in which the curvature varies exactly as the distance measured along the curve The "cubic parabola," more or less modified, is the most common. It is used on the Philadelphia & Reading, L. S. & M. S., N. Y., N. H. & H., and C., B. & Q. Searles' spiral (a system of compounded curves, of equal length and regularly increasing degrees of curvature) is used on the Nor. Pac. and on the Union Pac. The So. Pac. and the Mich. Cent. use systems of their own which are also a series of compound curves but different in their details. The D., L. & W. uses the purely empirical method proposed by Trautwine in his book on Railroad Curves.

3. *What is the lower limit of curvature on which you consider the curves necessary?* On the L. S. & M. S. transition curves are being placed on "practically all" the curves. The majority of answers gave 1°, 1° 30′ and 2° as the lower limit. The Union Pac. uses spirals only on curves of 3° and over, and the Nor. Pac. on curves of 4° and over.

4. *What rule regulates the relation of length to degree of curve?* As the answer to this is a matter of judgment, it is not surprising that there was little uniformity in the answers. A few are quoted: "50 ft. per degree of curve" [C., B. & Q.]; "100 ft. per degree of curve preferred; decreased to 60 or even 30 ft. if necessary" [C., C., C. & St. L.]; "uniform [total] length of 150 feet" [D., L. & W.]; "200 to 300 ft." [L. S. & M S.]; "In valley lines the length of transition curve is made as great as practicable, with the condition to never make the length of the main curve less than 60 ft." [So. Pac.]

5. *What methods are employed to enable trackmen to maintain the track at the true curve?* The difficulty in accomplishing this seems to deter some roads from attempting transition curves at all, based on the argument that the track will very soon shift and that nothing but an unreasonable demand on the engineering department will enable the trackmen to keep the track true. A few quotations on this point are significant. "Track is laid originally to substantial track centers which are easily found if necessary, the centers being placed each 30 ft. on transition curves and each 50 ft. on main curves. Also when originally ballasting, strong stakes are firmly driven to top of ballasted rail height, one stake 5 ft. each side of center each 30 ft. on transition curves and each 50 feet on main curves. These stakes at once show any marked departure from true line, and they last for many years. When necessary, true line is retraced by transit and track relined, but it is not often required." [So. Pac.] "We set stakes—usually old angle bars driven 2½ ft. into the ground and marked on the top by a chisel mark—these stakes being set every 50 ft. Outside of our track we indicate the elevation to be given both at the beginning point of the spiral and at the place where the spiral and circular curve unite." [C., C., C. & St. L.] "We place monuments made of old rail at the points of curve and tangent of both the center curve and the easement curves, and we place intermediate stakes 50 ft. apart for the trackmen to line by as often as required." [C. B. & Q.] The Philadelphia & Reading and also the N. Y., N. H. & H. use stone monuments placed at the beginning, center and end of each elastic curve. Oak stakes, accurately centered, are placed at intermediate points. Nearly all the roads employing transition curves report the use of the above methods more or less modified.

6. *Have you discovered any uniform tendency for the track to shift laterally in any one part of the curve? Is there any difference in this respect (on double track) between transition curves running* ON *the curve and those running* OFF *the curve?* The object in asking this question was to establish from the testimony of experienced men one great point of evidence as to the value of transition curves. The tendency of traffic to throw the track laterally near the ends of curves (when no transition curves are used) is familiar. The *invariable* answer to this question was that with transition curves this tendency is greatly reduced or is eliminated altogether. The uniformity of the evidence on this point is a strong argument in favor of such curves, as it shows that what is otherwise a large element of resistance has been eliminated. A few quotations on this point are significant. "We are much pleased with the results of the work done, as are our trackmen, and although it has been nearly three years since the curves referred to were first staked out, trackmen have had no occasion to ask for intermediate stakes for re-lining, and measurements recently taken show that the curves which were lined up at the time specified are practically in the same position as they were then placed." [Phila. & Reading] "In this connection [tendency to track shifting] I have observed that the flange wear, which frequently exists beyond the limits of a simple curve, has not yet been found on our tracks beyond the limits of a curve eased at the ends, which absence of flange wear I attribute to the gradual replacement of the truck from its skewed position to a square position." [Mich. Cent.]

7. *Do the trackmen take kindly to the system and take an interest in keeping the alignment true, or do they consider it an impracticable, theoretical refinement?* Although any one may say, "My men do as they are ordered," yet in such work as track maintenance, where so much depends on the faithfulness and care of the trackmen, it would not be very easy to satisfactorily maintain any system of work which the trackmen held in contempt as an impracticable refinement. The answers to this question were very instructive. A few are quoted. "They [the trackmen] soon found their labors greatly reduced near points of curve by the reduced tendency of track to get out of line, and they like the transition curve in consequence." [So. Pac.] "Our trackmen have taken kindly to transition curves, and have developed a very live interest in them, now that they realize that by them they get so much better riding track, and that there is really no additional difficulty in keeping the track lined up to them when stakes are properly given and taken care of." [L. S. & M. S.] "They [the trackmen] have found that it is for their own interests, as the track rides much better, and consequently complaints are few." [N. Y., N. H. & H.]

After such strong indorsements of the use of transition curves, it is nevertheless only wise to consider the stand that is taken on this subject by two railroads which are justly famous for the perfection of their roadbeds, viz., the Pennsylvania Railroad and the New York Central & Hudson River Railroad. On both of these roads no transition curves (properly so called) are used. For light curves no easement of any sort is used; for curves of about 4° and over, a lighter curve is introduced at each end and compounded with the main curve. The avowed object is simplicity in re-aligning and maintaining track, and a distrust of the practical advantages to be gained, especially in view of variable train velocity. The computations for track work are certainly more complicated when transition curves are employed, but that should weigh but little with educated engineers. The field work is a little more complicated, but the checks are as numerous and as certain as in simple curves. As to practical advantages, only experience can decide, and the evidence given above is certainly very weighty.

Another very practical feature of this subject is its economic bearing. On the one hand it is assumed that the demand on the engineering department will be always very great for the maintenance of such curves, and also it is assumed (too hastily) that track labor will be largely increased. But the evidence just given shows, on the other hand, that the trackmen's labor is "greatly reduced" by the "reduced tendency of the track to get out of line;" that flange wear of rails near the ends of curves is reduced. The absence of lateral shifting means the absence of forces, which, when they exist, can only act as destructive resistances, causing increased engine and car repairs, increased consumption of fuel, increased track maintenance and even decreased passenger traffic. Of course the effect of these for the passage of a single train over a single curve is very small, but, considering the number of curves and the number of trains per day or per year, the total loss would probably not only justify any necessary amount of engineering work, but would make the use of such curves a large measure of economy to the road.

One more word seems necessary in regard to the application of transition curves to old roadbeds. From some answers received there would seem to be an impression that transition curves can never be applied except by throwing the central curve inward a considerable amount, which would be very expensive, or even impracticable on a curve through a deep cut or skirting a steep bluff. But, since it is generally accepted that curve resistance varies as the number of degrees of central angle rather than as the degree of curve, it follows that a slight increase in the degree of the central curve is of no importance whatsoever compared with avoiding a shock at the beginning and end of the curve. All good systems of transition curves are worked up to fit these cases. For example, to quote a case before me already worked out, an 8° curve having a central angle of 44° 16′ was modified to an 8° 39′ curve (radius decreased 53 ft.), and two spirals 210 feet long. Opposite the old P. C. the curve was thrown *in* 0.91 foot, and in the middle (opposite the apex) the curve was thrown *out* 0.75 foot. Between these points it crossed the old line. The length of the new line differed from the old by only 0.12 foot in 360 feet (for each half of the curve), and even this difference could be further reduced (by closer calculations) so as to avoid any necessity for cutting rails. If more convenient, the new curve could be kept wholly *outside* the old curve. It is a close situation in which the track cannot be shifted a fraction of a foot without incurring unreasonable expense for additional excavation or embankment. And yet with these comparatively slight changes, all the advantages of a spiral can be obtained.

WALTER LORING WEBB,
Assoc. M. Am. Soc. C. E.

National Convention of Railroad Commissioners.

The seventh annual convention of State Railroad Commissioners was held in Washington May 14 and 15 The attendance was rather small. All of the Interstate Commerce Commissioners except Mr. Morrison were there, together with Secretary Mosely and Statistician Adams. but the state representatives who were present are comprised in the following short list, in which, it will be observed, secretaries and other representatives are about as plentiful as Commissioners:

Alabama, H. R. Shorter, Ross C. Smith; Connecticut, G. M. Woodruff, William O. Seymour; Billings, Secretary; Georgia, Allen Fort, L. N. Trammel, G. G. Jordon; Briscoe, Secretary; Illinois, J. W. Yantis, Secretary; E. A. Richardson, Clerk; Iowa, W. W. Ainsworth, Secretary; Maryland, H. D. Bulkley, for Governor: Michigan, S. R. Billings; Minnesota, Ira B. Mills; A. K. Teisberg, Secretary; Missouri, H. W. Hickman, Joseph Flory; North Carolina, E. C. Beddingfield, S. O. Wilson; North Dakota, John W. Currie, George H. Keyes, John J. Wamberg; J. E. Phelan, Secretary; Ohio, William Kirkby; W. B. Gaitree, Chief Clerk; Pennsylvania, I. B. Brown, Secretary of Internal Affairs; South Carolina, J. C. Welborn; Virginia, J. C. Hill; West Virginia, A. B. Fleming, for the Governor; Wisconsin, D. J. McKenzie.

There were also present the following representatives of the Association of American Railway Accounting Officers: D. A. Waterman, C. I. Sturgis, H. M. Kochersperger, M. Riebenack, Erastus Young.

The Chairman was Mr. Fort, of Georgia, and the first business was the report of the committee on railroad statistics, read by Mr. Adams. The committee believed that traffic statistics should be so made up that state commissioners could make a classification of freight movement and freight revenue, so as to be able to deduce the average revenue per ton, per mile for *each kind of freight*; and this would enable commissioners to judge more perfectly as to the effect upon the revenue of proposed changes in rates, would aid in determining the reasonableness of many rates and, with proper supervision of accounts, would aid in detecting rebates; but as the clerical labor which such a work would impose upon the railroads would be quite expensive the committee recommended that the matter lie on the table.

This committee also reported on the feasibility of securing a division of earnings and expenses by states. The substance of the recommendations was that (where states require companies to report such statistics), the cost of road, etc., capitalization and fixed charges should be apportioned on the basis of mileage of road in each state; that earnings on interstate traffic be apportioned on a mileage basis and likewise the earnings from other sources than transportation; and that operating expenses be apportioned according to the train mileage in each state. After a brief discussion the report was laid over until the second day.

This committee also discussed the subject of compilation of railroad statistics, to see whether State Railroad Commissioners ought to agree as to what and how much they would include in their annual reports; but the conclusion arrived at was that as some States want one kind of information and others other kinds no uniform rule could be prescribed. Mr. Kirkby, of Ohio, however, presented a monority report recommending the plan pursued in his State.

Mr. Woodruff, of Connecticut, read a paper on the regulation of electric railways, which showed that he had

given careful study to the subject. He estimates that there are 850 electric railroads in the country, having 9,000 miles of track and 23,000 cars. These roads are capitalized at 400 millions or $44,500 a mile. After showing the different peculiarities of wagon, omnibus, horse car, standard railroad car and electric car traffic, and pointing out that the peculiarity of the latter is the weight of the vehicles and the high speed in streets, Mr. Woodruff went on to show the superficial way in which the courts have thus far dealt with this subject. He said:

So recent authority as Elliott defines a street railway to be a railway laid down upon roads or streets for the purpose of carrying passengers, and says that the distinctive and essential feature of a street railway, considered in relation to other railroads, is that it is a railway for the transportation of passengers and not for freight, and the definition as given by Booth is almost identical; but the leading railroad company of Connecticut is already equipping a branch line for the use of electricity, and other railroad companies are doing like work, so that the motive power can no longer be regarded as sufficient to determine the distinction between a "railroad" and a "street railway"; neither is the character of the business performed any longer distinctive, since electric roads are already engaged in all the kinds of transportation in which steam roads are engaged. We have not at hand any statistics up to date, but six months ago, at the time of the Atlanta convention of the American street railway association, out of 413 companies reporting, all of course doing a passenger business, 35 were also doing express business, 55 were transporting freight, and 62 carrying the United States mails, and this, too, notwithstanding the fact that in at least three states such companies were forbidden by general laws from carrying either express or freight, and like prohibitions were incorporated in charters granted in other states. It appears, therefore, that in practice the distinction based on the character of business done is disregarded, and the courts of at least one state—California—have declared that no good reason for the distinction exists, but that the transportation of freight by modern and improved methods is equally entitled to encouragement with the transporting of passengers, and equally demanded by the wants of the citizens.

Again the distinction based upon the location of tracks no longer exists. The recent Pennsylvania decision will put electric roads outside of city limits on the same footing with steam roads. . . . If the electric roads, when they become intertown or interstate roads, are to be compelled to secure their own rights of way, and we believe they should be so required, then there must be at the same time conferred the right of eminent domain, as their construction would otherwise be impossible. Electric railway companies seeking to build roads from one town to another, or through adjoining towns from one state to another, should be authorized so to do either by general laws or by special charters, with like privileges as steam roads, but subject to like conditions, restrictions, and regulations as to location, especially at highway crossings, construction, operation and supervision, both state and interstate, as are applied to steam railroads and railroad companies.

The discussion on this paper was postponed to the second day, and Mr. James Peabody, of the *Railway Review*, read a paper on the "Protection of Public Interests During Railroad Labor Contests." Mr. Peabody held that:

It is only when public obligation is discharged that the subordinate relation of employer and employee becomes effective, and it is because of the failure to discriminate in this respect that transportation has been so many times interrupted. By so much as public concern is superior to private interests, by so much are the men engaged in railroading obligated to sink their individual interests in the conservation of public welfare. In the working out of the industrial problem men engaged in transportation have, in common with all others, a deep personal interest, but they also have, as others have not, public interests intrusted to their charge to which, so long as they remain in the service, their own must be subser vient. How these to elements may be adjusted so as to protect the one without injury to the other is a problem apparently beyond present solution.

Mr. Teisberg, of Minnesota, presented a resolution asking Congress to see about ascertaining, for the benefit of the public, the cost and present value of the railroads of the country, but after some discussion it was laid upon the table.

It was voted that the next convention be held on May 19, 1896.

On the second day, Wednesday, Mr. Woodruff's paper on the Regulation of Electric Railroads was referred to a special committee of five with instructions to bring in a report next year with recommendations for state and national legislation. The resolutions of the committee on statistics, reported on Tuesday, were adopted. The resolution of Mr. Teisberg asking Congress to get information about government ownership of railroads was taken from the table and referred to a special committee of five to report next year.

Interstate Commerce Commissioner Knapp read a paper on "The General Relations of Railroads to the State," which seems to have been the feature of the meeting, but it does not appear in the report of the proceedings.

The committee on uniform classification of freight made report re-submitting the report of the same committee made last year. Following this the report entered upon a discussion of the obstacles to securing uniform classification, from which it appears that the difficulties in the way of this reform are better appreciated by this body than has been the case heretofore. The report contains extracts from a letter received from Traffic Manager Bird, of the Chicago, Milwaukee & St. Paul. Mr. Bird says:

"Local and sectional influences are as effective and troublesome in this matter as in the tariff question in Congress. We cannot, of course, by adoption of uniform classification, deprive State Commissioners of the right to make classification which is conferred upon them by their respective legislatures, but we want them, by the action of the National Association of Commissioners, to be so much committed to the principle of uniformity that they will not, without urgent reasons, change classifications and destroy the uniformity which is so much desired.

"The completion and adoption of new and uniform classifications will not end the matter. A classification, no matter by whom made, will be found to contain errors, which must be corrected, and additions would have to be made quarterly or semi-annually. The machinery for corrections and additions must be framed with care. Again, the number of classes and the general arrangement of the classifications that will ultimately be adopted to apply on all interstate traffic will not be such as to conform with the rate sheets which have been established by legislative action, or by the commissioners of the various states under legislative authority. A uniform classification, such as desired, should embrace from 8 to 12 classes. In the event of success in the matter of uniform classification for interstate traffic, it will be necessary to procure the hearty co-operation of all State Commissioners to a complete revision of local state rate sheets, so that they may conform to the requirements of the new classification. This subject has been carefully considered, and it is believed that, with the co-operation of the various State Commissioners, necessary changes can be made without doing violence to the fundamental bases of rates of the various states."

The committee recommended that a special committee be appointed to meet at an early day, and try to get the railroads to confer with them, and this recommendation was adopted. In the discussion which followed, Mr. Mills, of Minnesota, said that he found traffic managers in the West more inclined to believe that uniform classification was possible than they were two or three years ago. It appears, however, that this hopeful view is conditioned on action by Congress, making uniformity in some degree compulsory.

The meeting next entered upon a general discussion on the subject of annoyances suffered by consignees in collecting overcharges. Vexatious and unreasonable delays of valid claims, seem to be the rule in every state that was represented. Commissioner Knapp said that the complaints of specific overcharge received by the Interstate Commerce Commissioners were more numerous

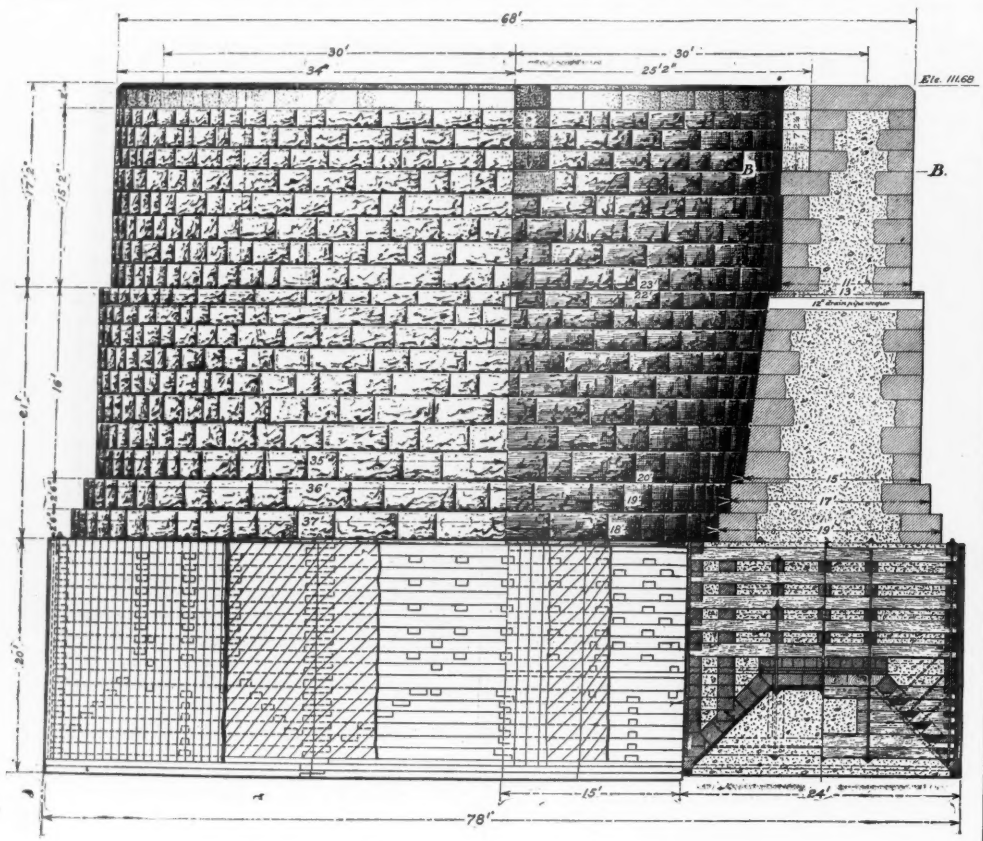


Fig. 2.—Section and Elevation of Caisson and Pier, Third Avenue Bridge.

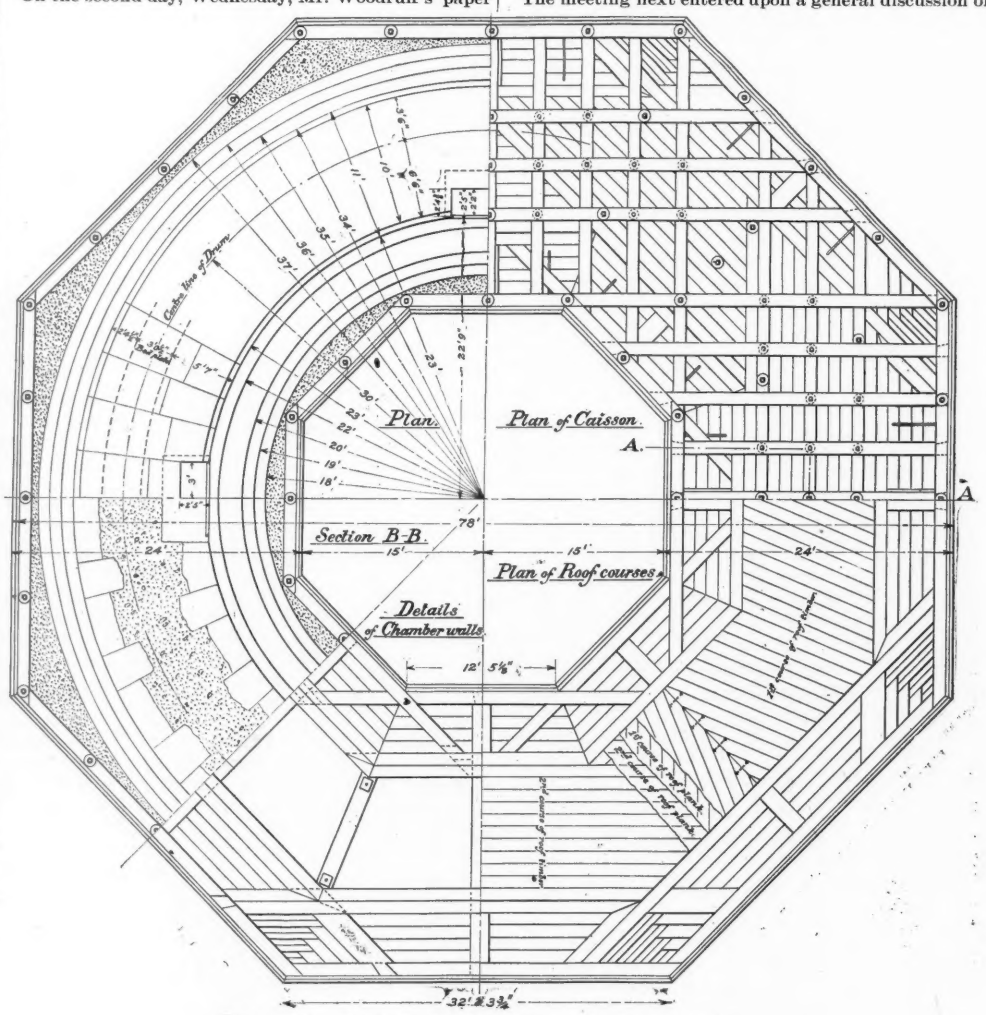


Fig. 1.—Plan of Caisson for Pivot Pier, Third Avenue Bridge.

than all other complaints combined. He thought that possibly the State Commissioners might do some good by concerted action in calling the attention of railroad managers in their several states to the widespread character of this evil. Mr. Fort, of Georgia, thought that possibly a law permitting a consignee to recover double the amount of overcharge, with costs, would rapidly reduce the red tape. Railroads would begin to see that a station agent who can correct an undercharge can also correct an overcharge.

After this discussion the Committee on Organization for next year's convention reported the following names as officers for that convention: Chairman, Mr. Billings, of Michigan; Vice-Chairman, Mr. Currie, of North Dakota; Secretary, E. A. Moseley, Washington, D. C. This report was adopted.

Demurrage on freight cars was next taken up, and Mr. Woodruff stated that the rule in Connecticut was to charge no demurrage until after four days. At the present session of the legislature there was an attempt to have the law changed, but the shippers objected so strenuously that the railroads deferred to their wishes. Mr. Flory, of Missouri, said that at a recent hearing in his state every shipper admitted that demurrage charges were a a benefit to the shipper. Previous to 1894 the charge in that state for cars standing on private tracks was only 50 cents a day, and the owners of such tracks still claim that they ought to pay less than the regular rate.

On motion of Mr. Seymour, of Connecticut, it was resolved that a committee of five be appointed to see that next year a commissioner from each state comes to the convention with a report describing the powers, duties and actual work of his commission. The object of this motion was to give life to the convention. Sitting there in a dignified manner and hearing excellent papers read, and then going away without discussing them, was a waste of valuable time.

Mr. Moseley called the attention of the convention to the fact that the national law requiring grab irons on freight cars and regulating the height of drawbars goes into effect on July 1 next. The subject of interchangeable mileage tickets was brought up by a Western commissioner, but Mr. Billings pointed out that the Massachusetts Supreme Court had decided that the law could not compel one road to honor the tickets of another.

The Pivot Pier of the Third Avenue Bridge Over the Harlem.*

Work on the Third avenue swing bridge over the Harlem River, between 129th and 135th streets, New York, is progressing; the caisson for one of the rest piers has been sunk and the masonry work for this pier is almost completed. The caisson for the central or pivot pier was recently completed by the contractors and is now being sunk. This pier is somewhat novel in its construction being annular in design, the center having no weight to carry and consequently remaining empty. The weight of the pier is about 8,234 tons, while that of the superstructure of the draw span is 1,800 tons. This gives a total weight of 10,034 tons on the bottom of the river. Dividing this by 4,300 sq. ft., which is the area of the bearing surface of the pier, gives 2⅓ tons pressure per square foot on the bottom. We give elsewhere an engraving of this pier in plan, elevation and section. As will be seen, the caisson is an octagonal ring, 78 ft. wide over all, and having eight faces, each 32 ft. 3¾ in. in length. The octagonal space within the caisson is 30 ft. wide, making the width of the caisson proper, or ring, 24 ft. The detailed drawings of this pier show all the dimensions clearly. The caisson itself is 20 ft. high, while the entire pier will be about 60 ft. high to reach a suitable bearing in the boulder gravel, which has been indicated by the borings.

The circular masonry wall varies from 19 ft. in thickness at the bottom to 11 ft. under the coping, the inner and outer diameters at the top being respectively 46 ft. and 68 ft. That portion of the pier below low water is faced inside and outside with coursed limestone ashlar. In diminishing the thickness of the wall the batter is made on the inner face, the outer being vertical. That part of the pier above low water has an inside face of limestone and an outside face of granite, the hearting throughout being of Portland cement concrete in the proportions of 1½ barrels of Portland cement to 1 cu. yd. of concrete. The other ingredients are two parts of screened gravel and one part of sand. About 43 cu. ft. of the separate materials make a cubic yard of concrete when mixed and rammed. The caisson is filled with concrete of the same character and proportions as that just described.

The reason for adopting an annular pier arose from the fact that the extreme width of the bridge necessitated a drum of very large diameter to carry and distribute evenly among the wheels the weight from the four trusses. Sixty feet was found to be the minimum diameter which could accomplish this, and any part of the caisson or masonry inside the ring would be useless, since the weight would not be distributed in anything like the proportions borne by the outside parts. Then, too, the pressure per square foot is so small that additional area of bottom would be useless. This pressure, as we have shown, is only 2½ tons per square foot, which is a perfectly safe load on the hard gravel which underlies the pier A bearing for the center hub is provided by four girders, whose ends are borne in recesses shown in the section of the pier on its interior face, just below the coping.

The reason for using pneumatic caissons instead of the cheaper pile foundations for the river piers arose from the impossibility of driving piles at the sites chosen because of the cast-iron cylinders filled with concrete which formed the foundation of the old piers. It was impracticable to locate the new pivot pier at any other point than that chosen, which, as we have said, was the site of the old pivot pier. The shore piers will probably have pile foundations, because the coffer dams which are to be used will enable the contractors to excavate the old foundations and the debris of old wharves, etc., before driving the piles.

The general framing of the timber work of the caisson is shown in the plan Fig. 1. The timber used is all yellow pine with the exception of the two cutting edges, which are of oak. Fig. 1 shows the construction of the caisson clearly. There are four courses in the roof of the air chamber, two of timber and two of plank laid diagonally. The caisson was caulked both inside and out with oakum. Four excavating shafts are used in sinking it and four main shafts, and the work is done in

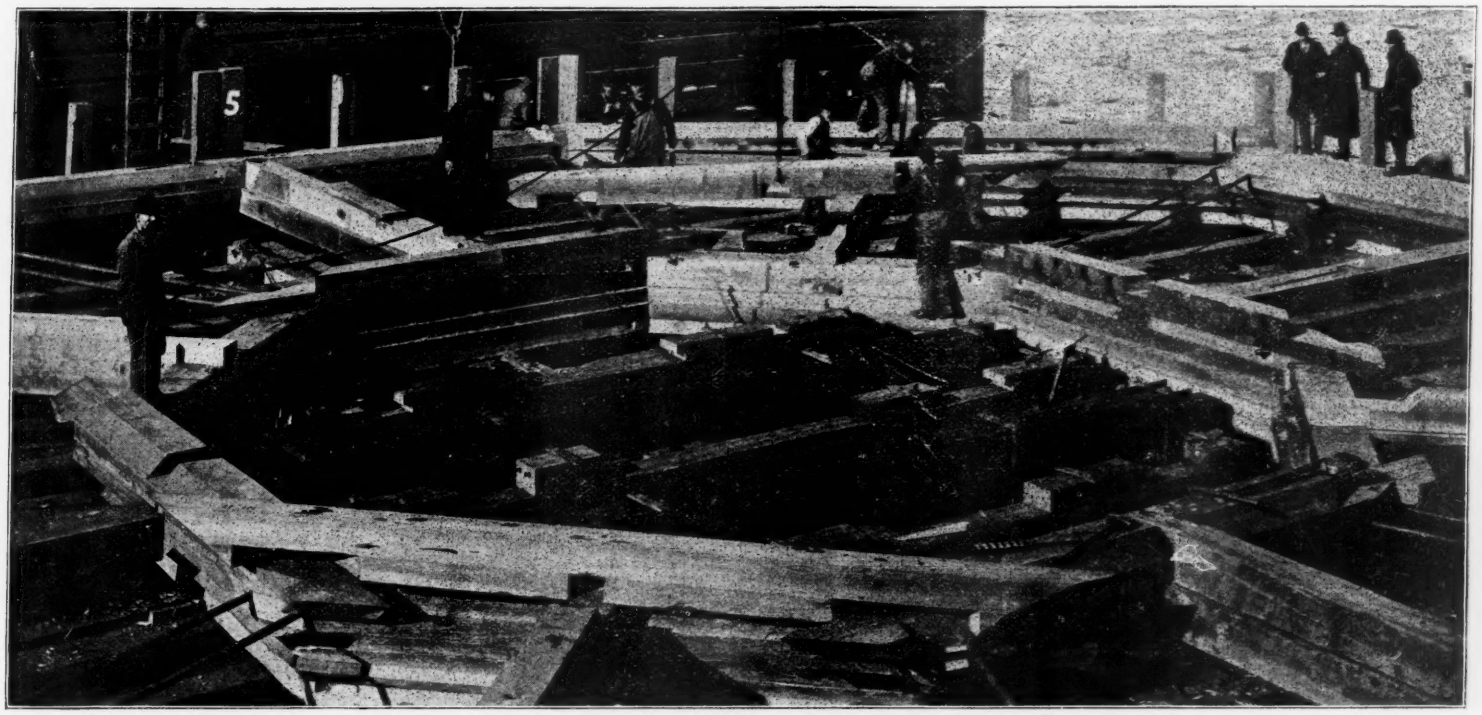


FIG. 3.—LOWER TIMBER COURSES OF CAISSON IN POSITION UPON THE SCOW.

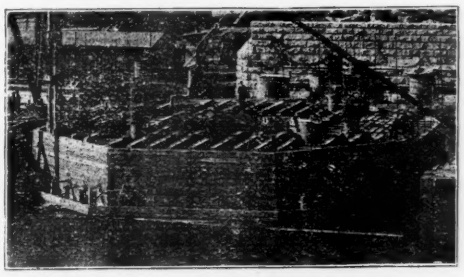


Fig. 4.—Caisson Before Sinking.

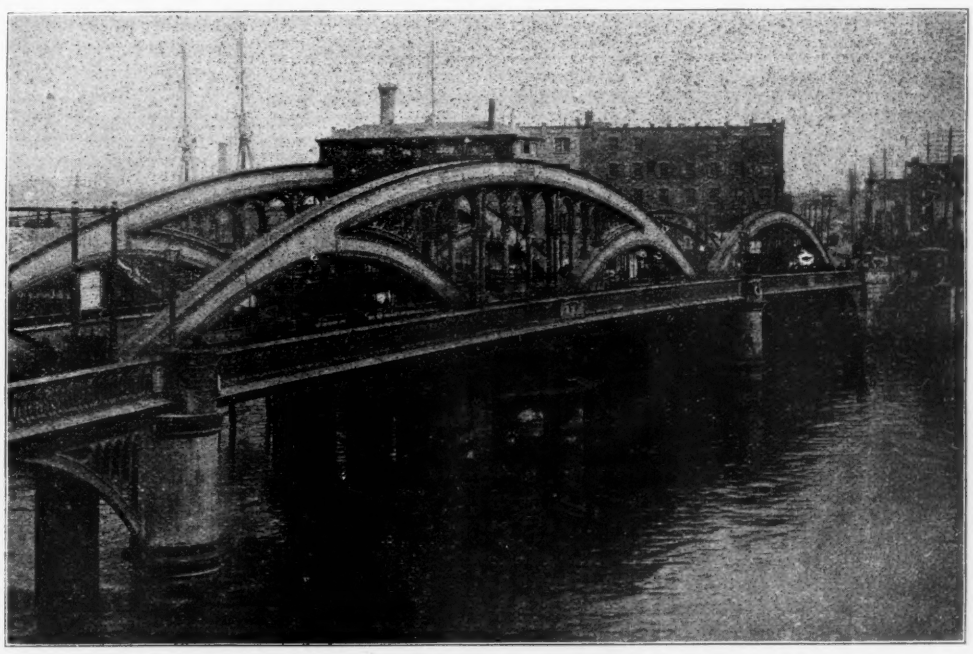


Fig 5.—The Old Third Avenue Bridge Over the Harlem.

*For complete description and plans of the superstructure of this bridge see *Railroad Gazette* for Sept. 15, 1893.

three shifts, about 60 men being in the air chamber at one time. The caisson will be sunk to a depth of about 50 ft. below high water. It was built on a large octagonal scow, joined together in two parts which were separated and sunk from under the caisson when it was ready for sinking. This scow, with the first courses of timber work for the caisson, is shown in Fig. 3. Fig. 4 shows an engraving of the caisson just before being launched. The edges of the scow just mentioned are seen near the water line.

This bridge replaces the old Third avenue bridge which was torn down at the time of beginning work upon the structure now being built. The foundations were made of cast iron columns six feet in diameter, filled with concrete. Those of the pivot pier, which have been removed in sinking the caisson, were sunk to a depth of 50 ft. below high water, same as present pivot pier will be. No settlement has ever taken place. It is shown in Fig. 5 and resembles the English bridges of 20 years or more ago. It was built by William J. McAlpine and E. W. Miller, as engineers, and John Roach, contractor. On taking it down, all the various parts were found to be in an excellent state of preservation. The plates were not badly rusted and the riveting was fairly tight. The workmanship and materials were found to be of the best qualit y

The temporary bridge, over which the large traffic of the Harlem River and Third avenue now passes, was constructed at the time of beginning work on the new bridge. This draw span is of steel and is operated by the machinery which was formerly used for the draw of the old bridge. A few figures of the traffic which passes over this structure will show the great volume of travel at this point on the river, which traffic will ultimately pass over the bridge now being built. The number of vehicles which pass over the temporary bridge daily is about 5,000. Between 12 p. m. July 9 and the same hour July 10, 1894, 4,996 vehicles passed over the bridge. It is probable that the traffic has increased since then, so that 5,0[illegible] is a low estimate. The number of openings of the dra[illegible] per day averages 60, occupying in all about five hours. Comparing these results with those upon some other swing bridges across much traveled streams, we may take the traffic on the Tower bridge over the Thames at London. This averages about 6,030 vehicles per day, during which time about 19 openings of the bridge take place. On the Brooklyn bridge the vehicles average about 4,000 per day, or about one-fifth less than those over the temporary Third avenue bridge.

Another fact not generally known is that the tonnage of vessels going in and out of the Harlem River is not much less than the tonnage clearing from the port of New York for foreign ports. In 1893 the latter comprised 5,037 vessels, representing 7,015,030 tons. Commercial statistics for the year ending June 30, 1893, show the actual tonnage of the Harlem River and Spuyten Duyvil Creek to have been 5,910,376 tons. This is actual tonnage, there being no record of the registered tonnage of the Harlem River. After the ship canal just completed at Spuyten Duyvil is put into use, the amount of tonnage of the Harlem River will doubtless be greatly increased.

This bridge is being built by the Department of Public Works, G. W. Birdsall, Chief Engineer, H. Mason, Assistant Engineer. The bridge has been designed and is superintended by Thos. C. Clarke, M. Am. Soc. C. E., assisted by John F. O'Rourke, M. Am. Soc. C. E. The general contractor is Isaac Hopper, of New York; for steel work, Phœnix Bridge Co.; Pneumatic Foundations Arthur M. Maher & Co., New York; machinery for draw, Jos. Edwards & Co., of New York.

The International Railroad Congress.

Eight of the American railroads will be represented by delegates at the International Railroad Congress which convenes in London on June 26. Twelve railroad companies in this country are members of the Congress, and one or two of those who have not yet decided to appoint delegates may decide to do so, before the Congress assembles. We have already printed the names of the officers delegated to represent their companies as the appointments were made, but for convenience, and as a matter of interest to railroad men, we collect below the names of the railroads now members of the Congress and their delegates:

Arizona Southeastern.—James Douglas, President.

Denver & Rio Grande.—George Coppell, Chairman of the Board; Edward T. Jeffery, President; C. C. Beaman, Counsel; John L. Welsh and R. T. Wilson, Directors, and Howard Gilliat, London Agent.

Fitchburg.—H. S. Marcy, President, and W. L. Chase Director.

Lehigh Valley. — Charles Hartshorne, Vice-President, and Rollin H. Wilbur, General Superintendent.

Nashville, Chattanooga & St. Louis.—J. W. Thomas, Jr., Assistant General Manager, and perhaps by other officers.

New York Central & Hudson River.—C. M. Depew, President; H. Walter Webb, Vice-President; J. M. Toucey, General Manager; Walter Katté, Chief Engineer; William Buchanan, Superintendent of Motive Power and Rolling Stock.

New York, New Haven & Hartford. — Charles P. Clark, President; F. S. Curtis, Chief Engineer; C. H. Platt, General Superintendent (New Haven System); E. G. Allen, General Superintendent (Old Colony System); John Henney, Jr., Superintendent of Motive Power; S. A. Gardner, Superintendent of Fall River Line; C. C. Elwell, Engineer Maintenance of Way (New York Division); J. G. Parker, President's Secretary.

Pennsylvania.—Frank Thomson, First Vice-President Pennsylvania Railroad Co.; T. N. Ely, Chief of Motive Power; James McCrea, First Vice-President Pennsylvania Co.; James L. Taylor, General European Passenger Agent.

Richmond, Fredericksburg & Potomac.—Possibly by E. T. D. Myers, President.

Los Angeles Terminal.—Possibly by George B. Leighton, President.

The Chesapeake & Ohio and the Louisville & Nashville, who are members of the Congress, will not send representatives.

The *American Railway Association* will be represented by H. S. Haines, President American Railway Association and Vice-President Plant System; W. F. Allen, Secretary American Railway Association; J. T. Harahan, Second Vice-President Illinois Central Railroad; C. W. Bradley, General Superintendent West Shore Railroad; J. J. Frey, General Manager Atchison, Topeka & Santa Fe Railroad; Theodore Voorhees, First Vice-President Philadelphia & Reading Railroad, and J. R. Kenly, General Manager Atlantic Coast Line, and Alfred Walter, President Delaware, Susquehanna & Schuylkill Railroad. Mr. Ramsey, of the Terminal Railroad Association of St. Louis, and Mr. E. B. Thomas, President New York, Lake Erie & Western Railroad, who were appointed delegates on behalf of the Association, were obliged to decline the appointment, and Messrs. Kenly and Walter have been appointed in their places.

Headquarters for the use of all American delegates to the Congress will be established at the Victoria Hotel, London

The Delegates of the Lehigh Valley, the Nashville, Chattanooga & St. Louis, the New York, New Haven & Hartford; Mr. Ely, and probably Mr McCrea, of the Pennsylvania, and the representatives of the American Railway Association, except Mr. Voorhees, will sail on the steamship New York, of the American Line, on June 12.

Our readers who have followed the numerous articles which have been printed in these columns in reference to this Congress in the last year or so, will be familiar with its nature and objects. These were described in our issue of April 6, 1894, page 248. The list of subjects to be discussed at this session was published in the same issue, page 239.

A Graphical Method of Studying Questions of Haul of Earthwork—The Mass Diagram.*

BY PROF. C. FRANK ALLEN, *M. Am. Soc. C. E.: Mass. Inst. of Technology.*

It is difficult to determine, from an ordinary profile, exactly how earthwork should be handled; that is, to determine the most favorable position of the points at which backward haul shall cease and forward haul begin; or, again, to determine the most favorable points for borrow and for waste, in cases where borrow pits or waste banks are available almost anywhere. A study of such questions may be made very advantageously by means of the "Mass Diagram," a graphical method used but little in this country. A reference to Fig. 1 and Fig. 2 will illustrate the construction of the "Mass Diagram." In the profile, Fig. 1, the quantities are found to be as shown in the accompanying table, in column *B*, where cuts are shown + and fills —. Beginning at 0 the cut from 1 to 2 is added to that from 0 to 1, and so throughout, column *C* showing totals from the beginning, all + quantities being added each time, all — quantities subtracted.

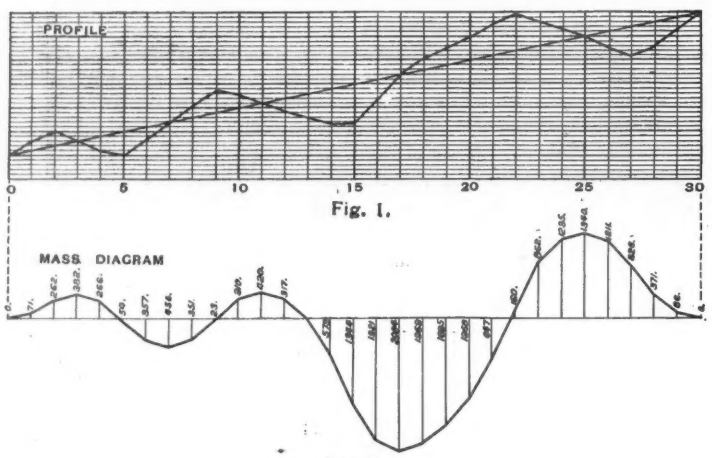


Fig. 1.

Fig. 2.

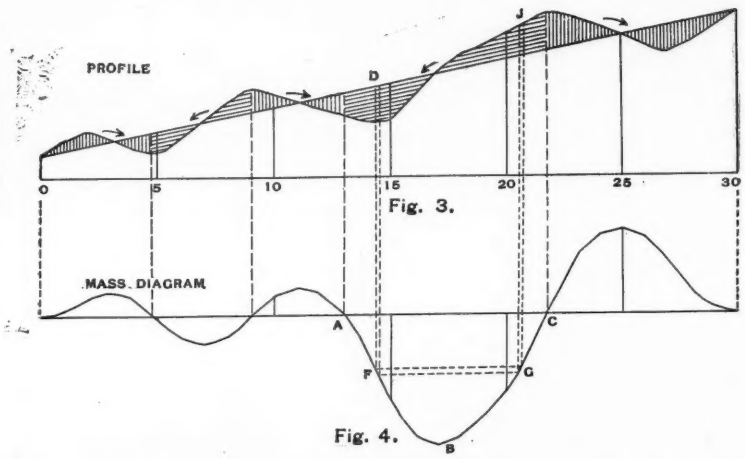


Fig. 3.

Fig. 4.

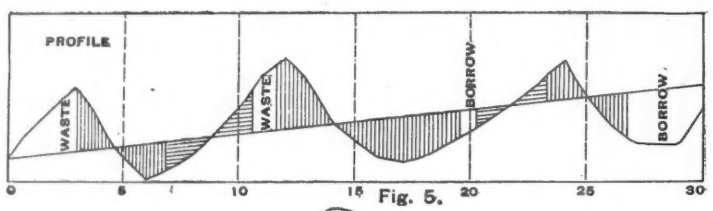


Fig. 5.

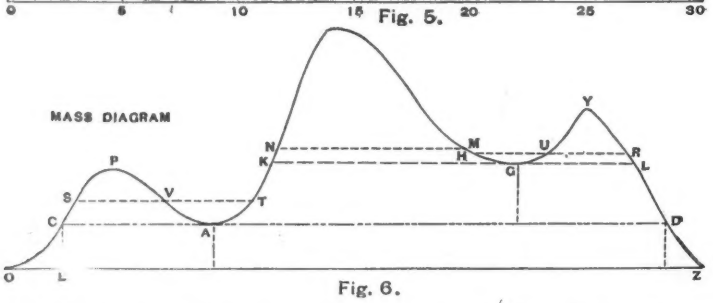


Fig. 6.

A	B	C	A	B	C
Station.	Solidities.	Total Solidities.	Station	Solidities.	Total Solidities.
0		0	16	— 577	— 1921
1	+ 71	+ 71	17	— 163	— 2084
2	+ 191	+ 262	18	+ 115	— 1969
3	+ 120	+ 382	19	+ 284	— 1685
4	— 116	+ 266	20	+ 417	— 1268
5	— 320	— 54	21	+ 621	— 647
6	— 303	— 357	22	+ 807	+ 160
7	— 99	— 456	23	+ 702	+ 862
8	+ 105	— 351	24	+ 373	+ 1235
9	+ 328	— 23	25	+ 105	+ 1340
10	+ 333	+ 310	26	— 129	+ 1211
11	+ 110	+ 420	27	— 385	+ 826
12	— 103	+ 317	28	— 455	+ 371
13	— 318	— 1	29	— 285	+ 86
14	— 572	— 573	30	— 86	0
15	— 771	— 1344			

For the construction of the "Mass Diagram," each station is projected down from the profile and the value from column *C* is platted to a convenient scale; at each point is shown the total to that point; all + quantities are platted above the line, all — quantities below the line. The points are connected and we thus have the "Mass Diagram."

As a result of the methods of computation and construction, the following properties are found to attach to it.

1. Grade points of the profile correspond to maximum and minimum points of the diagram.

2. In the diagram, ascending lines represent excavation, and descending lines embankment.

3. The difference in length between any two vertical ordinates of the diagram, shows the solidity between the points (stations) at which the ordinates are taken.

4. Between any two points where a horizontal line intersects the diagram, excavation equals embankment.

5. The measure of the "haul" between two points cut by a horizontal line is the area of the diagram cut off by that line.

In reference to the last proposition, it may be well to

* Copyright 1895, by C. Frank Allen.

say a word or two. Lines are more common for graphical representation than areas, nevertheless areas are often used. An indicator diagram represents, if you see fit to use it so, foot-pounds; a dynamometer or dynagraph record similarly shows foot-pounds (a product). In a similar fashion, the "Mass Diagram" area shows a product of yards hauled, into distance hauled, or "haul." In Fig. 3 then the area *A B C* represents, to a suitable scale, the yards × distance hauled between *L* and *M* where cut equals fill. This may be shown by tracing an elementary solid *I* in cut, to its place in fill *D*, where area *F G* shows the "haul." This is proper since between *D* and *I* cut equals fill. A summation of all solidities from *L* to *M* will show that area *A B C* measures "haul" between *L* and *M*.

It may be shown, if one desires to follow it out, that a curved line joining the various points will give results more nearly correct, theoretically, than if straight lines be used. It will further be noticed in Fig. 3 and Fig. 4 that hill sections of the "Mass Diagram" show haul forward and valley sections haul backward. The "Mass Diagram" will serve then as a guide to determine how the work shall be performed; where forward haul ceases and backward haul begins, as is shown in Fig. 3 and Fig. 4.

Further possibilities of the "Mass Diagram" are illustrated in Fig. 5 and Fig. 6. It can readily be determined, in practical cases, what is the limit or distance where it is profitable to haul material rather than to borrow and waste. For illustration, in the case of Fig. 5 and Fig. 6, 800 ft. is taken as the limit of profitable haul. Drawing the horizontal line *C A D*, it is evident from the "Mass Diagram" that the solid from *O* to *E* (measured in amount by *C E*) cannot be hauled to advantage, since above *C A D* cut equals fill, and therefore a mass measured by *C E* must be hauled a distance greater than *C D*. The mass of earthwork from *O* to *C* must then be wasted and *O Z* borrowed. Similarly *K G L* shows that a mass equal to *A K* must be wasted, and a mass equal to *L D* borrowed. We have assumed that 800 ft. marks the limit of profitable haul, and *N M* is a horizontal line 800 ft. long. Thus an additional mass equal to *K N* must be wasted, and a mass equal to *M G* must be borrowed. We have then to be wasted masses shown by *O C* and by *A N*. Between *C* and *A* we have thus all forward haul. If we draw *S V T* we have forward haul between *S* and *V* and backward haul between *V* and *T*. Under this arrangement we waste a mass represented by *O S* rather than *O C*, and again a mass *T N* rather than *A N*. The total amount wasted, whether *O C* + *A N* or *O S* + *T N* is the same. The only question is, which is more favorable as to "haul?" The haul is measured in one case by the area *C S P V A*, in the other case by the sum of the areas *S P V* and *V A T*. It is evident that *S P V* + *V A T* is less than *C S P V A*, and represents therefore a preferable arrangement. It may be shown that when *S V* = *V T* the most advantageous arrangement it reached, since a change either up or down would increase the sum of the two areas. In a similar way *H U* and *U R* should be made equal. Having made a complete study of the question in Fig. 6, the proper points are projected up to Fig. 5, and the most suitable method of executing the work there indicated. The advantage of this method lies in the fact that the whole question lies clearly before the engineer in the shape of the "Mass Diagram" and a full study of it can be made. It is not easy to suggest any other method by which correct results can be surely reached, for instance in finding the positions of *S*—*V*—*T* such that minimum cost of haul will result. Where borrow and waste do not admit of free haul, modifications must be made, but anyone who understands well the nature of the "Mass Diagram" as outlined above, will be able to extend its use to all necessary cases.

Porter Locomotive, New York & Brooklyn Bridge.

We show herewith an engraving from a photograph of a light locomotive, 14 in. × 18 in., built for use on the Brooklyn bridge, by H. K. Porter & Co., Pittsburgh, Pa. We give below the general dimensions of this locomotive.

General Dimensions.

Type	Switching, 4 driver with front and back pony truck.
Name or number	Specf. Nos. 1,579 and 1,580.
Name of builder	H. K. Porter & Co. Locomotive Works.
Name of operating road	New York & Brooklyn Bridge Cable Railroad.
Gage	4 ft. 8½ in.
Simple or compound	Simple.
Kind of fuel to be used	Anthracite.
Weight on drivers	57,400 lbs.
" " trucks	22,500 lbs.
" total, with full tank and coal bunker	79,900 lbs.
Wheel base, total, of engine	18 ft. 11¾ in.
" " driving	5 ft. 0 in.
" " total (engine and trucks, wheel base)	18 ft. 11¾ in.
Length over all, engine	24 ft. 1 in.
" " " total, between drawheads	28 ft.
Height, center of boiler above rails	5 ft. 9¼ in.
" of stack above rails	12 ft 7 in.
Heating surface, firebox	61.5 sq. ft.
" " tubes, outside	625 sq. ft.
" " total	686.5 sq. ft.
Grate area	15 sq. ft.

Wheels and Journals.

Drivers, number	4
" diameter	42 in.
" material of centers	Cast-iron
Truck wheels, diameter	26 in
Journals, driving axle, size	7 × 7⅝ in.
" truck " "	3¾ × 6 in.
Main crank pin, size	4 × 5½ in.

Cylinders.

Cylinders, diameter	14 in
Piston, stroke	18 in.
" rod, diameter	2⅝ in.
Kind of piston rod packing	Garlock,
Main rod, length center to center	62⅝ in.
Steam ports, length	13 in.
" " width	1 in.
Exhaust ports, length	13 in.
" " width	2 in.
Bridge, width	⅞ in.

Valves.

Valves, kind of	Balanced Slide, with relief valve
" greatest travel	4 in.
" outside lap	⅝ in.
" inside lap	⅛ in.
" lead in full gear	⅛ in.
" " constant or variable	Variable

Boiler.

Boiler, type of	Straight top
" working steam pressure	160 lbs
" material in barrel	Hammered cast steel
" thickness of material in barrel	⅞ in.
" diameter of barrel at smoke-box end	48 in
Seams, kind of, horizontal	Double riveted
" " " circumferential	Double riveted
Thickness of tube sheets	⅞ in.
" " crown sheet	½ in.
Crown sheet stayed with	Crown bars
Dome, diameter	22¼ in

Tubes.

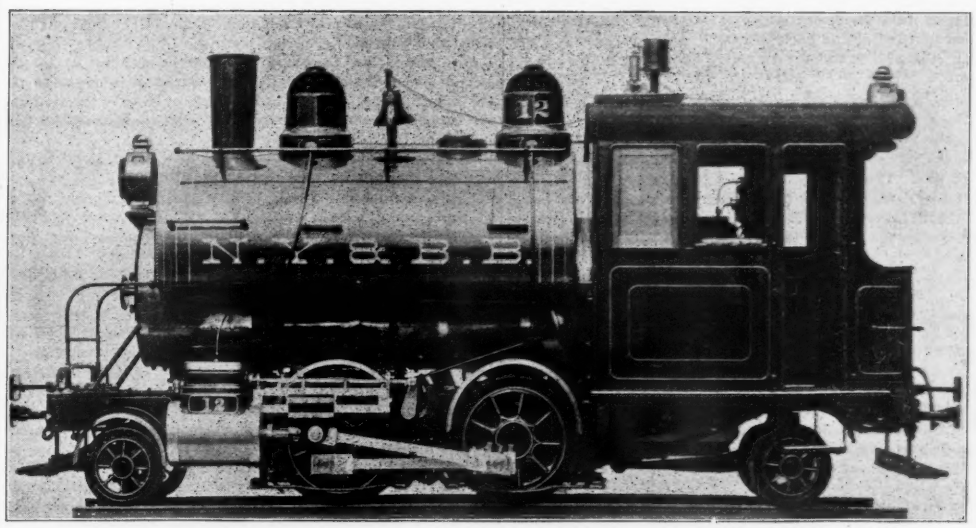
Tubes, number	166
" material	Charcoal iron, No. 12, B. W. G.
" outside diameter	1¾ in.
" length over sheets	99 in.

Firebox.

Firebox, length	59 in.
" width	36⅝ in
" depth front	43⅛ in.
" " back	38 in.
" material	Hammered cast steel
" thickness of sheets	⅝ in. and ½ in.
" brick arch	None
" water space, width: front, 3¼ in.; sides and back.	2¾ in.
Grates, kind of	Water tube and wrought iron bars

Smokebox.

Smokebox, diameter	48 in.
" length	47 in.



Porter Locomotive—New York & Brooklyn Bridge

Other Parts.

Exhaust nozzle, single or double	Single
" " variable or permanent	
" " diameter	3¾ in.
" " distance of tip above center of boiler	4½ in.
Netting, plate?	Yes
" size of perforation	¼ in. × 1½ in.
Stack, straight or taper	Taper
" least diameter	13 in.
" greatest diameter	17 in.
" height above smokebox	58 in.
Track curves of 100 ft. radius, maximum grade	3 77 per cent.
Water tank capacity	1,000 gals.
Coal capacity	1,750 lbs.

These locomotives have been built for a particular service. After midnight trains over the bridge are hauled by locomotives, the cables being stopped. The traffic has become so heavy that one engine could not pull four loaded cars up the heavy grade on the Brooklyn end of the bridge. Two locomotives have been used for this purpose, of 25 tons each, being the regular switching engines. To save fuel, extra crews and wear on the bridge, one 40-ton locomotive will hereafter be used They have been tested, and one of them has hauled six empty 20-ton cars over the bridge and up the heavy grade of nearly 4 per cent., out of Brooklyn, without any trouble. During the day the new locomotives will be used for switching.

Specifications for Interlocking Work.

BY MR. GEORGE H. PAINE.

(*Concluded from page 307.*)

[In the *Railroad Gazette* of May 17 Mr. George H. Paine proposed a set of specifications for interlocking work, his purpose being to draw attention to what seems to be a neglected matter in the art of signaling, and to awaken interest that may lead to combined action with a view to establishing standard specifications. The specifications which he has prepared are put out for criticism and as a framework on which to build, rather than as final. They are founded on a set of rules prepared for use on the Pennsylvania Lines West of Pittsburgh. The portion published last week covered the description of the signals.]

SPECIFICATIONS OF CONSTRUCTION.

The Cabin shall be located so as to give the best view of the tracks consistent with economy in the construction of the plant, convenience in operation and a regard to future extension. The Machine shall be so placed as to leave a passageway entirely around it and the framing of the Cabin shall be so arranged as to permit of enlarging the Machine without alteration, other than removing the Upper Floor, which shall be not less than 13 ft. above the rail. The Windows in the upper room shall be of a sufficient size and number to provide a view of all tracks from any part of the Machine and the horizontal division between the panes shall be not less than 6 ft. 6 in. above the floor. The communication between the upper floor and the ground shall be by means of an Outside Stairway the lower reach of which shall never lead towards a track. The Door in the lower room shall never open directly onto any track and the Floor of the Lower Room shall be at the same height as, and a continuation of, the timbers that support the lead out.

The Machine shall be of some approved pattern constructed in groups of four or eight levers, and its parts shall be of the same size and identical in machines of all sizes. The levers must have two positions only—Normal and Reversed; the Locking must be positive in each direction of its movement, not dependent upon gravity or the use of springs, and it must be preliminary in the sense that the raising of any Latch Rod must lock all conflicting levers. The Machine must be placed upon a sufficient Foundation distinct from that of the cabin, and its parts must be so arranged as to be susceptible of frequent Inspection, easy Cleaning and Repair.

The Levers shall be numbered from left to right, and arranged in the following general manner: Switch, Frog and Lock Levers in the center; next on either side, Spare Spaces and Spare Levers; next beyond, the Home Signal and Dwarf Signal Levers, and on the extremities of the machine the Distant Signal Levers. The levers must not be Overloaded.

The Locking must be carefully tried and checked before the machine is put in service. Switch Levers shall be so interlocked as to accomplish the greatest amount of divergence in the Routes with the least interference in the movement of Trains. The reversing of Home Signal Levers and Dwarf Signal Levers must force the previous reversal of all the Lock Levers upon the route that has been set. A Distant Signal Lever must lock reversed all Home Signal Levers which govern main line trains moving upon the track and in the direction to which it relates.

Combination Movements may be operated from one Lever as follows:

Several Home Signals and Dwarf Signals through a Selector; a Switch, Lock and Detector Bar through a Switch and Lock Movement.

A Lock or Detector Bar shall never be operated by the same Lever that operates a Home Signal or Dwarf Signal.

Rocking Shafts must be 2¼ in. in diameter, varying in length as the situation requires; an intermediate Bearing shall be provided for all Shafts exceeding 6 ft. in length and two intermediate Bearings for all Shafts longer than 12 ft.

Cranks for pipe connections shall be made of wrought iron or mild steel, mounted upon a substantial stand, with two Bolts and two Lag Screws each, for fastening them to their Foundations. The Center Pins of all cranks, including Box Cranks, shall be supported both at the top and the bottom, and not more than three Horizontal Cranks shall be mounted upon the same axis.

Pipe Lines should not be nearer than 3 ft. to the gage side of the nearest rail when located outside of the tracks. They shall be formed of iron or steel, with welded seams, 1 in. inside and 1¼ in. outside diameters The connection between two pipes shall consist of a Sleeve, a Plug and two Rivets, and shall be located not less than 12 in. from the nearest Pipe Carrier when the lever is on the center. All connections between Switches, Derails, Frogs, Locks, Selectors and their respective Levers shall be formed of pipe. The distance between Pipe Carriers or other points of support shall not exceed 8 ft.

Pipe Carriers shall be of the kind known as "plain," that is having a fixed center of revolution for the bottom roller. They shall be made in nests, the shafts continuous and held in place by split cotters and the distance between the centers of adjacent Rollers shall be 2¾ in.

Pipe Compensators shall be of the Lazy Jack pattern, the Cranks and Links of wrought iron or mild steel mounted upon a substantial stand; the center pins shall be supported both above and below the cranks

Compensators shall be provided as follows for different lengths of pipe.

Length of Pipe Feet.	Number of Compensators.
From 100 to 700	1
" 700 to 1,400	2
" 1,400 to 2,100	3
" 2,100 to 2,800	4
" 2,800 to 3,500	5

No Compensator is required for a line less than 100 ft. in length.

Offsets must not be placed in Pipe but in Cranks, Jaws or other solid metal and they must not exceed 2½ in. between any two pipe carriers or other points of support.

Derails shall be placed on the side which will least en-

danger the traffic should a run-off occur. Facing Point main track Derails if operated by a Switch and Lock Movement must be checked by a Bolt Lock worked by the Home Signal: should this arrangement not be adopted a separate Facing Point Lock must be used.

Detector Bars shall be used at all Switches, Derails and shifting Frog points: a continuous space of 45 ft. shall be covered by Detector Bars in the immediate vicinity of each moving part of a track in such manner that the position of the Bars cannot be altered during the continuance of a pair of wheels on that part of the track. Detector Bars shall be placed on the outside of the rail, and move in a plane inclined a little from the vertical and toward the center of the track. The Bar shall be slightly beveled on its upper outside edge, and shall be placed as near the rail as possible, rising in the middle of its arc to a point ¾ in. above and falling in its extreme positions ¼ in. below the top of the rail. Not less than 12 Supports shall be used with each 45-ft. Bar, the space between any two Supports shall not exceed 4 ft. 6 in., and the End Supports shall not be placed more than 3 in. from the Ends of the Bars, which Ends shall be cut off square, not rounded or chamfered at the corners.

Facing Point Locks must be placed outside of the track wherever possible, and connected with the two Fixed Rails by a Tie Plate. Two Plungers of rolled steel shall be provided for each Facing Point Lock, so shaped or placed that it will be impossible for either Plunger to enter the hole in the Lock Bar that is intended for the other; one of these Plungers shall lock the Switch always in the Normal, the other always in the Reversed position. The ends of the Plungers that enter the Lock Bar shall be blunt, with sharp edges, and entirely without taper. The holes in the Lock Bar shall not be counter sunk, and shall not exceed the Diameter of the Plungers by more than $\frac{1}{16}$ in. The Lock Bar shall be connected with the Front Rod of the Switch by an adjustable Jaw, and after passing under the Rails shall be brought to the elevation of the Lock Plungers by an Offset, if necessary, but never by a Goose-neck or a reverse in its direction. A Detector Bar shall always be used in connection with a Facing Point Lock which shall be placed at all Facing Point Main Track Switches and Derails not otherwise controlled by a Switch and Lock Movement and Bolt Lock: at Main Track Single Slips, and at all Moving Frog Points and Double Slips.

Switch and Lock Movements must lock a switch in both positions, and their mode of operation in either direction must be to first raise the Detector Bar and unlock the Switch, next move the switch and last Lock the switch and lower the Detector Bar. The end of a Lock Plunger must be blunt with sharp edges, not tapered; the Holes in the Lock Bar must also be without taper, not countersunk, and shall not exceed the Diameter of the Lock Plunger by more than $\frac{1}{16}$ in. The Base must be framed and bolted to the Cross Ties, and must be connected with the two Fixed Rails of the track by an iron Tie Plate. The Switch and Lock Movement shall not be used at a Facing Point Switch on the main track except in connection with a Bolt Lock, nor shall it ever be used at a main track, Single Slip, or at any Double Slip or Moving Frog Point.

Bolt Locks must be so constructed that a rod intended for a certain notch will not enter the notch of another rod in the same lock under any condition of service. When placed at a main track Facing Point Switch or Derail a separate Rod must be provided for each of the Home Signals on the post immediately in advance, controlling routes through that point.

Means of Adjustment shall be provided for each Switch Lock, Detector Bar, Selector, Counter-weight Lever and Bolt Lock Rod.

Foundations and Wire Carrier Stakes shall be of seasoned White Oak. The foundations for Cranks, Compensators, Chain Wheels and Selectors shall have the tops and sides dove-tailed and bolted together; they shall be cross-braced and so fixed in the ground that they will remain rigid during the movement of the levers in the machine. Pipe Carrier Foundations shall be 12 in. long on top for a one way Carrier; increasing 2¾ in for each additional carrier; the top and sides shall be dove-tailed and bolted together.

The Wire used for operating signals shall be No. 9 steel galvanized. It must be supported at points not more than 25 ft. apart, and when run contiguous to a line of pipe the Wire Carriers may be placed upon the pipe carrier Foundations. The Back wire shall have in all cases 1½ in. more stroke than the Front Wire.

Wire Carriers shall be made in nests of 2, 4 and 6, but the 6-way is to be used only where the line is perfectly straight. The Wheels shall be of cast-iron mounted in malleable iron Frames that are to be fastened to their supports with not less than two 1½-in. screws.

A Wire Compensator is to be used on all lines exceeding 1,000 ft. in length. It is to be arranged in such a way that compensation shall take place only when the Lever at the cabin is in the Normal position, and in connection with the Compensator means must be adopted to force the Disconnection of both lines of wire at the Signal Post should either line be broken. The Compensator must have a capacity of 20 in.

Chain Wheels shall be of two sizes, 6 in. and 8 in. outside diameter and not more than 4 on the same axis.

Chain shall be of ¼-in. iron, welded and capable of withstanding a strain of 2,000 lbs.

Split Links must not be used for splicing chain on wheels; their points must be well hammered down.

Signal Arms on main line uprights shall be 6 ft. apart, one above the other.

Semaphore and Back Light castings shall form an angle of 37½ deg. with the center line of the Signal Arm and shall be weighted so as to carry the signals to danger should any of the connections on the post be broken.

A Counter-weight Lever shall be provided for each Signal

Signal Posts shall be made of the best White Pine, free from sap, soft knots, shake or dry rot. They shall be placed on a framed and well braced foundation in a hole 6 ft. deep for a 30 ft. post increasing 1 ft. in depth for each increase of 6 ft. in the height of the post. Straight Posts shall be 7 in. square at the top blade and 10 in. square at the ground line. Bracket Posts shall have a main support 12 in. square, and 2 cross pieces formed of 3 × 12 in. white oak; the uprights shall be 7 in. square, placed 7 ft. 6 in. apart; all timbers of a Bracket Post shall be securely framed and braced.

Lamps shall have a front Lens accurately focussed, a 2-in. Bulls Eye in the back, and the same style of lamp shall be used for both Main Line and Dwarf Signals.

Pins must be a neat fit, but not driven in place; machine Turned and provided with Split Cotters.

All Parts of the same kind must be Interchangable.

Boxing of Pine lumber shall be used to cover all pipe connections outside of the Cabin (except in crossing tracks); all cranks, chain wheels, compensators, switch and lock movements, pipe carriers, selectors and lead-outs must be enclosed with movable covers; 1½ in. stuff shall be used for the tops of boxing, and 2 in. × 8 in. for the sides, all surfaced one side.

The Painting of the iron work on Signal Posts and of the Machine shall be done with black asphaltum, except the unfinished parts of the Levers above the floor which shall be as follows:

Movable frog, switch and derail levers	Black
Lock levers	Blue
Switch and lock movement levers	Black and blue
Home signal and dwarf signal levers	Red
Distant signal levers	Green
Spare levers	White

All boxing and iron work not otherwise specified shall be painted with two coats of good iron oxide mixed in boiled linseed oil.

All Connections must be so placed as not to interfere with the passage of a Snowplow or other vehicle. Changes or additions to Tracks and Buildings that are likely to occur, must be regarded in the installation of an interlocking plant in order that unnecessary alterations may be avoided, and every effort should be made to secure good Drainage at all of the moving parts.

INSTRUCTIONS GOVERNING THE USE AND MAINTENANCE OF INTERLOCKING PLANTS.

A Danger signal must not be disregarded. Trains must come to a stop before reaching a signal which stands at Danger. Lever men are required to report any violation of this rule.

The Absence of a signal, where a fixed signal is located must be regarded as a Danger signal. Trains must not pass any Home signal unless it is known to be at safety without first coming to a full stop.

When irregular movements are necessary, or the plant is out of order, trains may be flagged through the limits of the interlocking by the Lever-man.

Any known or supposed defect in a system of interlocked switches and signals, must be at once reported to the (officer in charge). No changes of any kind in the locking of a machine are to be made without special instructions for each case.

Side tracks used for Derails, must be kept clear of cars at all times throughout their entire length.

Engine-men must not use sand while standing or running over any switch within the limits of an Interlocking System.

A Daily Inspection of each plant must be made and any defect promptly reported to the (officer in charge).

All Moving Parts of the plant must be kept oiled and free from grit. Switch and frog points must be kept clear of cinders, sand and ballast. The machine must be kept clean and well oiled, and cabins must be found at all times in a neat and orderly condition.

Detector Bars must not be disconnected except for repairs which must be made as soon as possible.

Lever-men must see that no obstacle exists on a route before setting the signal for it. A route once set must not be altered until it is certain that no train has entered it

Lever-men must never attempt to move a switch or a detector bar when a train covers it or is closely approaching it. The failure of a detector bar will not relieve the lever-man from responsibility if a switch is moved under a train.

Any damage to an interlocking plant must be immediately investigated: lever-men must not flag a train through a plant until it is known that the tracks and switches are in a safe condition.

During cold weather the lever-men will move the levers frequently to prevent the connections from freezing up.

Levers should be handled with a steady movement. Lever men will be held responsible for any damage to the machine occasioned by rough handling. If a lever moves unusually hard or with unusual ease the cause should be at once investigated: an attempt to force a lever must never be made.

Oil, waste and extra parts for the repair of the plant must be kept in an appointed place, unexposed to the danger of fire and rust.

Lamps must be cleaned and filled daily. They must be lighted at least one-half hour before being taken from the cabin at night, to insure the fact that they are burning properly. They must be placed on the post not later than one hour before sunset, and must not be taken down earlier than one hour after sunrise. In dark or obscure weather, the lamps must remain lighted on the posts, to ensure the presence of a signal.

No Light must be permitted in a cabin where it can be seen from an approaching train.

Unauthorized persons must not be permitted in any signal cabin.

Ignorance of any of the above rules will not be taken as an excuse for any disregard of them. Train men, signal men and others concerned, must become familiar with them.

Train Accidents in the United States in April.

COLLISIONS.

REAR.

23d, on Manhattan Elevated, at the Grand street station, on the Sixth Avenue Line New York City a passenger train ran into the rear of a preceding passenger train which had been detained a short time at the station, wrecking the cab of the locomotive. One passenger was slightly injured.

28th, on Philadelphia, Reading & New England, at Poughkeepsie, N. Y., a freight train running eastward on the high bridge over the Hudson River broke it two on the decending grade approaching the eastern end, and the rear portion afterward ran into the forward one, derailing a platform car, which barely missed falling to the ground 100 ft. below.

And 19 others on 15 roads, involving 5 passenger and 21 freight and other trains.

BUTTING.

2d, on Maine Central, at Veazie, Me., butting collision between passenger trains 64 and 93, wrecking 3 engines and 2 baggage cars. One fireman was killed and 3 other trainmen were injured. The train despatcher gave an order to train 93, but did not give the same to No. 64, which was the train of superior right.

20th, 9 p. m., on Baltimore & Ohio, at Fredericktown, O., butting collision between a passenger train and a freight, wrecking several cars. Four employees on the passenger train were badly injured. It is said that a flagman was sent out by the freight but did not go far enough.

22d, on Norfolk & Western, near Montvale, Va., butting collision between a freight and a work train. A supervisor and 9 other employees were injured.

CROSSING AND MISCELLANEOUS.

1st, on Cleveland, Cincinnati, Chicago & St. Louis, at Bellefontaine, O., collision between a passenger train and a freight, ditching 2 freight cars. One fireman was injured.

13th, on Belt Railroad, at West 46th street, Chicago, a circus train, being backed into the Chicago & Northwestern yard, was run into by a switching freight of the latter road, wrecking a freight car and damaging 3 sleeping cars. One passenger was injured.

And 7 others on 7 roads, involving 3 passenger and 8 freight and other trains.

DERAILMENTS.

DEFECTS OF ROAD.

3d, on Union Pacific, near Pocatello, Idaho, a passenger train was derailed by a broken rail and 2 cars were ditched. Nine passengers were injured. A number of the injured persons were settled with on the spot; a lady badly cut in the head received $100; a man with two ribs broken accepted a similar amount, and an old gentleman who had his wrist cut took $10.

4th, on Atchison, Topeka & Santa Fe, near Rogers, Tex., a freight train was derailed at a broken switch, and several cars were badly wrecked. The station agent was injured by a timber thrown out from the wreck.

6th, on Dunkirk, Allegheny Valley & Pittsburgh, near Lilly Dale, N. Y., a gravel train was derailed by rails out of place at a point where the roadbed was unstable, on account of the presence of quicksand or water a considerable distance beneath the track. A length of about 600 ft. sank 7 ft., and the road was impassable for several days.

13th, on Flint & Pere Marquette, near Free Soil, Mich., a passenger train was derailed by a broken rail and the engine fell down a bank. The engineer and fireman were injured.

17th, on Vicksburg, Shreveport & Pacific, near Monroe, La., a freight train broke through a trestle which had been partly destroyed by fire, and the engine and 11 cars fell into a bayou, making a bad wreck.

18th, on Cape Fear & Yadkin Valley, near Goldston, N. C., a freight train was derailed at a place where the track had been weakened by heavy rains, and the rails loosened, and 6 cars were wrecked. A brakeman was injured.

29th, on Oregon Pacific, near Chitwood, Or., a freight train broke through bridge No. 24, and 14 cars fell to the ravine below. The engine crossed in safety, and the caboose was stopped before it reached the bridge. A brakeman was killed, and the conductor badly injured.

And 2 others on 2 roads, involving 2 freight trains.

DEFECTS OF EQUIPMENT.

1st, on New York, Lake Erie & Western, near Elmira, N. Y., a freight train was derailed by a broken journal and 6 cars were wrecked. One brakeman was killed.

5th, on Chicago & Alton, near Alton, Ill., a long freight train was derailed by the breaking of a platform car in the middle of the train, and many cars were ditched or overturned. There were about 75 tramps on the train, of whom 4 were killed and 15 injured.

5th, on Denver & Rio Grande, near Garrison, Col., a passenger train was derailed by a broken flange and the first 3 cars were overturned. The express messenger was injured and his car caught fire, but was not much burned.

12th, on Oregon Railway & Navigation, near Tekoa, Wash., a freight train was derailed by a broken journal and several cars were wrecked. A brakeman and two tramps were injured.

13th, on Manchester & Augusta, near Remini, S. C., a freight train was derailed by the breaking of an axle of an oil tank car. A hole was knocked in the tank and the oil was spilt along the track for a considerable distance. It became ignited and 12 cars were burned up.

15th, on Southern Pacific, near San Luis Obispo, Cal., a locomotive was derailed by a broken wheel and was overturned. The conductor and one brakeman were injured, the latter fatally.

17th, on Texas & Pacific, near Big Spring, Tex., a freight train was wrecked by the breaking of a coal car. Two men stealing rides were injured, one of them fatally.

18th, on Texas & Pacific, near Grand Saline, Tex., the engine of a freight train was derailed by the breaking of a connecting rod and 12 freight cars fell into a river. The fireman was injured.

25th, on Philadelphia, Wilmington & Baltimore, near Wilmington, Del., a freight train was derailed by a broken wheel, making a bad wreck. The conductor was injured.

And 12 others on 11 roads, involving 12 freight trains.

NEGLIGENCE IN OPERATING.

5th, on Carson & Colorado, near Wabuska, Nev., a mixed train was derailed by the overturning of a car which was loaded with cattle; the cattle became frightened and rushed to one side of the car, tipping it over. One brakeman was killed and 3 other trainmen were injured. The gage of this road is 3 ft.

6th, on Cammal & Black Forest, near Cammal, Pa., a freight train descending a grade became uncontrollable and a car of lumber, on which were 6 employees, fell down a bank. One of the men was killed and the others badly injured.

6th, on Great Northern, near Devil's Lake, N. D., a mixed train was derailed at an unfastened switch and one employee was injured.

18th, on Cincinnati, Hamilton & Dayton, at Dayton, O., a passenger train was derailed by a misplaced switch and the engine was overturned. The engineer and fireman were injured, the latter fatally.

29th, on Maine Central, at South Brewer, Me., a passenger train was derailed at a misplaced switch and the engine was overturned. The fireman was fatally injured.

And 3 others on 3 roads, involving 1 passenger train and 2 freight trains.

UNFORESEEN OBSTRUCTIONS.

5th, on Delaware & Hudson, near Port Kent, N. Y., a passenger train was derailed at a washout and the engine fell down a bank. The engineman was injured.

8th, on Southern Railway, near Marion, N. C., a freight train was derailed by a landslide and 9 cars were wrecked. The engineer and fireman were killed.

8th, on Valley Railway, at Akron, O., a freight train was derailed at a washout and the engine was overturned. The engineer and fireman were injured.

9th, 5 a. m., on Buffalo, Rochester & Pittsburgh, near Punxsutawney, Pa., a freight train was derailed by a

(*Continued on page 334.*)

American Steel Bolster Trucks.

In the accompanying engravings Fig. 1 shows the American steel truck made by the American Steel Foundry Company of St. Louis. It is of the rigid diamond type, and embodies several new features which are in the direction of progress.

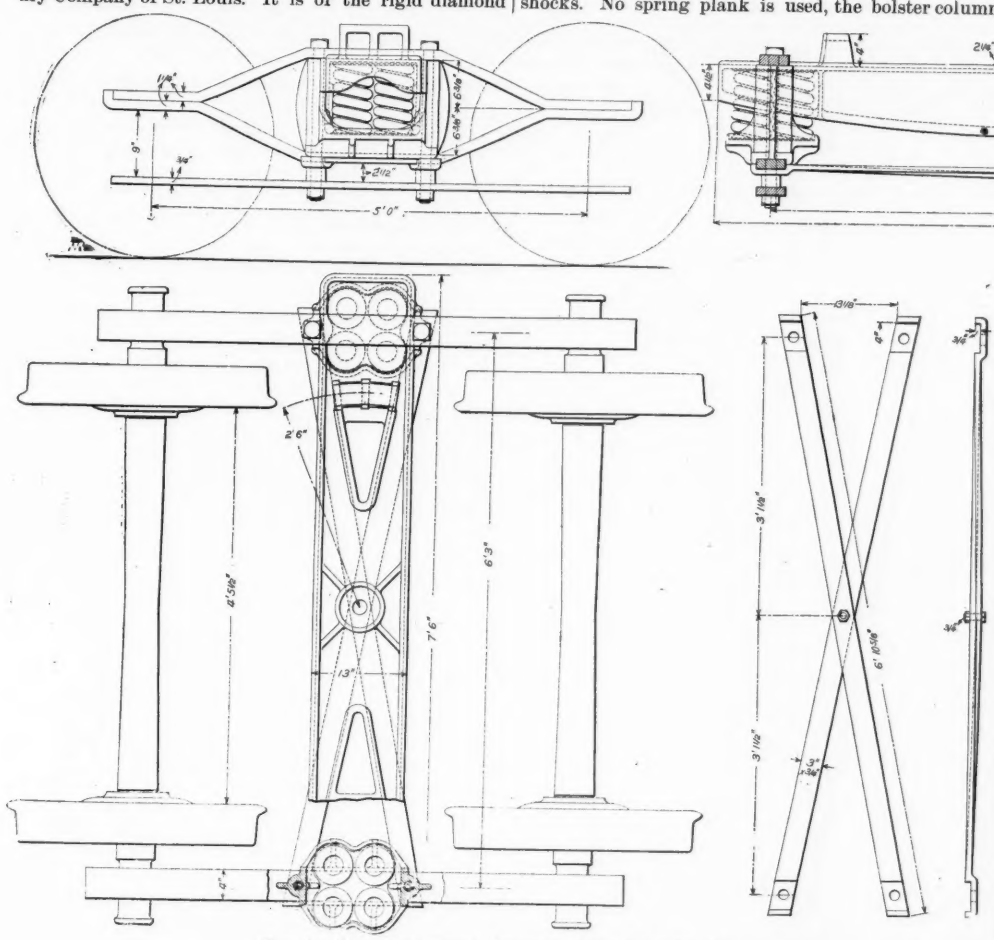


Fig. 1.—Cast Steel Truck, American Steel Foundry Co.

The bolster is made of basic steel which has a tensile strength of 60,000 lbs. to the square inch and is very tough. It is cast in green sand, the process of casting allowing the metal to shrink as much as it will without interfering with the drawing of the casting. An extra thickness of metal is provided under the center plate and around the lower edge at the side girders to further increase the carrying capacity. The center plate and side bearings are integral with the bolster. The side bearings are also made cup-shaped—that is, open at the top instead of closed, as shown in the drawings. It is strengthened by three ribs at the middle and one at each end, to provide against the increased stress due to lateral shocks. No spring plank is used, the bolster columns and spring seat being in one piece. This construction gives increased stiffness. A detail drawing of this combination casting is shown. The lower arch bar passes beneath the center of this casting, and is held by two longitudinal ribs, while the upper one rests on top of it and has no containing ribs.

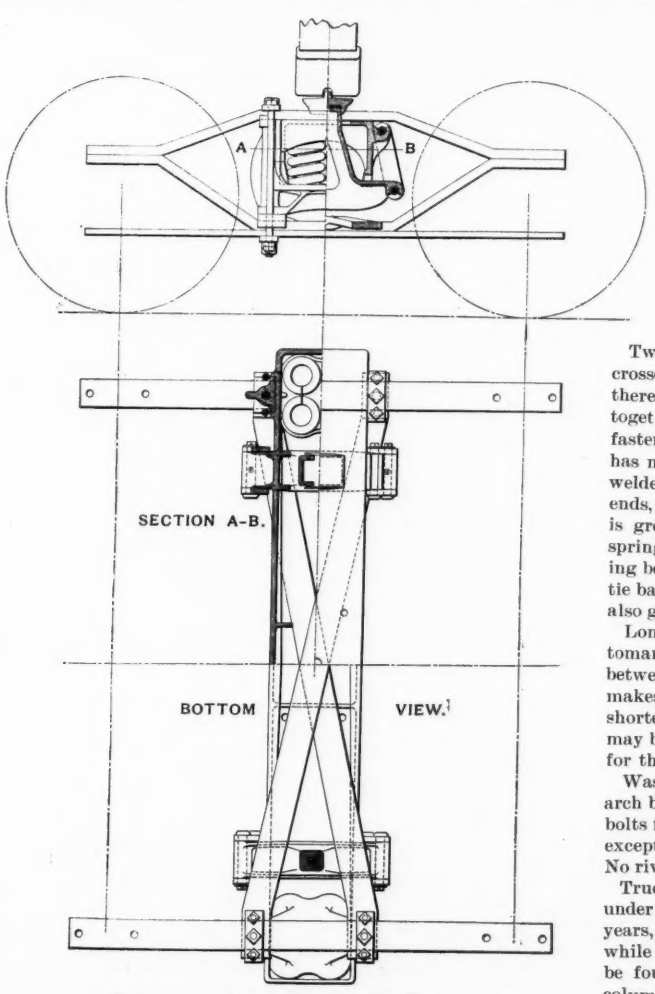


Fig. 2.—American Steel Tender Truck.

Two wrought iron 3 × ¾ in. tie bars, crossed at the center and welded together there, fasten the side frames of the truck together. In the drawing a bolt is shown fastening the tie bars at the center, but this has now been discarded and the bars are welded. The distance between the bars at the ends, where they are fastened to the frames, is greater than the width of an ordinary spring plank, thus insuring a firmer fastening between the frames. The ends of these tie bars are upset over the arch bars, which also gives an increased stiffness.

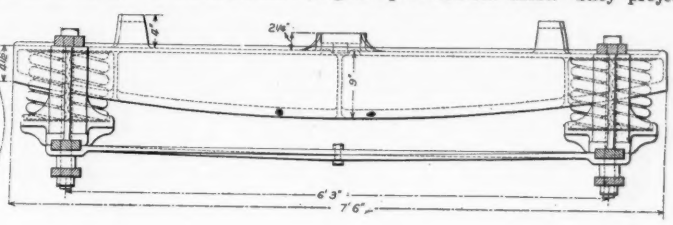
Longer coil springs are used than is customary, on account of the increased distance between the spring seat and bolster. This makes the car ride easier. However, if shorter springs are wanted, a wooden block may be put up under the end of the bolster for the springs to rest on.

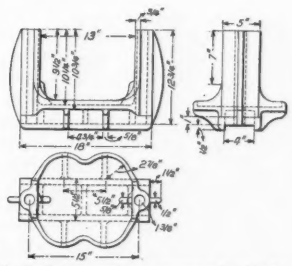
Washers are used to separate the lower arch bars from the tie bars, and the column bolts form the only fastenings on each side, excepting, of course, at the journal boxes. No rivets or other bolts are necessary.

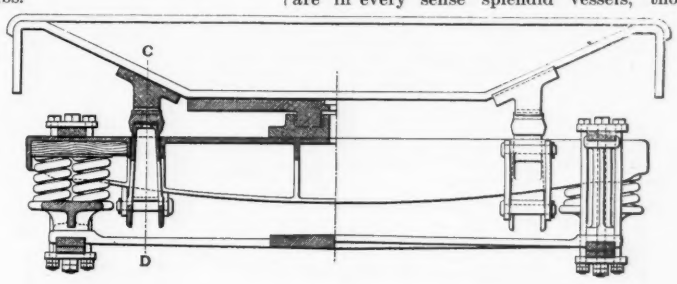
Trucks of this description have been in use under Missouri Pacific 60,000-lb. cars for four years, and from measurements taken a short while ago no distortion of the bolster could be found. The spring seats and bolster columns were also in as good condition as at first. It is said that not one cent has been spent in the maintenance of these trucks. In case of distortion of the bolster by wrecks it can be heated and restored to its original shape.

A guarantee of this truck is given for the life of the car, barring wrecks or derailments.

Figure 2 shows a tender truck made by the same company for the Missouri Pacific Railway. The most important difference between this bolster and the one previously described is in the side bearings. Separate castings are provided for these. They project up through the bolster and are swung by links from each side of the bolster. This is to permit easy motion of the trucks even when the tender may be down on the side frames. The center plate is also separate from the bolster. The bolster columns and spring seat are cast in one piece as before though slightly different in shape from the preceding one, and a wooden block is put in between the coil springs and bolster. Similarly, crossed tie bars instead of a spring plank are used, the weld at the center spoken of before is here shown.







New Hamburg-American Steamships.

The last of the five new twin screw steamers, the Palatia, built for the Hamburg-American Line, arrived at New York harbor on Friday of last week. The other new ships are the Patria, which like the Palatia was built in the ship yards of the Vulcan Ship Building Co., at Stettin, Germany, the Persia and the Prussia each with a tonnage of 6,000 built in the yards of Harland & Wolff at Belfast, and the Phoenecia, which like the Palatia and Patria has a tonnage of 7,118 and 5,500 H. P., but was built at the yards of Blohm & Voss, Hamburg. These five ships are in every sense splendid vessels, though nearly as large, but, of course, not as fast or as elaborately decorated as the great express ships owned by this line, the Normania, Fürst Bismarck, Augusta Victoria and Columbia, but the ships are very comfortable and handsome. They are all first-class, steel steamers, with twin screws of manganese bronze. The hull is divided into a large number of water-tight compartments, with double bottoms separated into water chambers after the Bracket system. The "Palatia" can accommodate about 50 cabin passengers, and each of the other vessels has accommodations for about the same number of first-class passengers. Particular attention has been given to making the steerage accommodations as comfortable as possible, and these are probably as convenient as on any other ships now crossing the Atlantic. As many as 2,500 steerage passengers can be carried on each vessel. In addition a limited number of intermediate passengers can also be carried.

The vessel is also fitted with two large refrigerating rooms of 30,000 cu. ft. capacity for transporting perishable freight. The total freight capacity of the Palatia is about 400,000 cu. ft. and her dead weight capacity is about 8,000 tons. Arrangements for carrying 500 head of cattle have been made under deck. The Palatia has triple expansion engines, the steam being supplied by three large double ended boilers. She has an average speed of 14 knots an hour. The stoke room of the steamer is fitted with two hydro-pneumatic ash ejectors. The Palatia has a length of 480 ft. over all, 460 ft. on the water line, a depth of 35 ft. and a tonnage of 7,118.

The Jeddo Tunnel

The Jeddo Tunnel has been connected with the mine which it is intended to drain and the water is said to be receding rapidly. The work of tapping the east gangways is now going on, and the holes for that purpose are being drilled.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

ontributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

A Case of Permissive Blocking.

Block signaling under permissive rules is not block signaling; but if the rules are carried out it is safer than the time interval. But in a good many cases they are not carried out, and so the most experienced managers, on the roads where the space interval has been longest used, look upon permissive blocking, if tolerated, as a necessary evil; and when they say all they mean, they condemn it. Such managers may find one more confirmation of their views in a recent rear collision of freight trains which blocked a great railroad all day and called out six wrecking gangs, though no one is reported hurt, and the case, therefore, will not be published in our monthly record.

The foremost train was either stalled or was moving very slowly, and the following one came rushing around a curve so fast that some observers near the road at once saw that the engineman "could not make the air brakes work," though he was doing his best; and they actually gave him enthusiastic praise for his heroic efforts; but a little further along the account seems to indicate that the engineman, instead of being a hero, was largely responsible for the collision, if not wholly so, for he had received a caution card at the last block station; "but it was necessary for the train to run at a high rate of speed to make the heavy grade a short distance ahead."

He knew that he ought to get over that grade without getting stalled, and he also knew, or ought to have known, that a caution card telling him to run under control, meant to run slowly enough to be able to stop after coming in sight of the preceding train and before he should strike it, assuming that the preceding train was at rest. But he tried to comply with both requirements at the same time and came to grief. Like so many others before him, he probably depended upon the flagman of the preceding train.

But depending upon the flagman is depending upon the time interval system, while yet, as a matter of fact, no time interval has been made. The flagging rule is retained in the code, but when, in establishing the block system, you announce that the time interval rules (87, 88, 89, standard code) need not be observed you admit, at the same time, that the flagging rule cannot be carried out, for one condition of that rule must be *some* time interval. If the brakeman cannot be sure of *some* time, he cannot feel safe to stay on the train at all. It is true that alert brakemen can generally get along all right in spite of the conditions on which we base this reasoning; but alert brakemen are not always available when we want them. Rules must at least provide for the "average" brakeman, if not for a grade lower than the average; and to do that, in this case, it is necessary to consider that the flagging rule is weak enough at best, but is still weaker when it has not a well-defined time-limit to support it.

And when we have got thus far, it is plain that permissive blocking should be made to stand on its own merits. If it is mixed with the time interval system, either officially and expressly, or unofficially by the trainmen, contrary to instructions, the resulting uncertainty and confusion of ideas will tend constantly to lead to collisions. As long as there is any requirement upon the foremost train to protect itself against the following train, it must be assumed that the engineman of the latter will partly depend upon it when he is put to it to make time. Nothing but the eternal vigilance of an inspector, day and night, will make the "average" engineman do otherwise.

State Control of Rates.

The United States Supreme Court has lately handed down two decisions which are valuable additions to the body of our law on the subject of railroad rates. Both cases have a rather wide bearing, and are the most important utterances of the Supreme Court on the rate question since the Minnesota wheat rate cases and the Texas Commission Case. In each case suit was brought against a railroad for charging higher passenger rates than the law allowed; and there was one question common to both cases which was decided in the first, and this decision was merely reaffirmed in the second suit.

In the suit against the Norfolk & Western it was found that the company was charging on its lines in Virginia a rate considerably higher than that permitted by the general railroad law of that state, which is of some forty years standing. The company replied that it was the lineal successor to certain charters which put it out of the range of this law and allowed it to regulate its own charges. It traced its descent as follows:

The Norfolk & Western is the successor of the Atlantic, Mississippi & Ohio, which was foreclosed in 1881; this earlier company was, in its turn, a consolidation of three older railroads, and the charters of these companies, which were granted in 1848, gave them the full power to fix their own rates until their profits should rise to 15 per cent. per annum. It was claimed that the Norfolk & Western, being in the direct line of descent, was now operated under these original charters which it received through the Atlantic & Mississippi, and, as its profits had never come anywhere near to 15 per cent., that it could charge whatever passenger rate it pleased in defiance of any later statute. The Court, however, emphatically denied this claim, and held that, in such a case, the subsequent corporation, which is created under the general railroad law, does not inherit the peculiar privileges and powers of its predecessor. In the words of the opinion: "In the absence of express statutory direction, or equivalent implication by necessary construction, provisions in restriction of the right of the state to tax the property, or to regulate the affairs of its corporations do not pass to new corporations succeeding by consolidation, or by purchase under foreclosure, to the property and ordinary franchises of the first grantees; that a mortgage of the franchises and property of a corporation made in the exercise of a power given by statute confers no right upon purchasers at a foreclosure sale to exist as the same corporation, but to reorganize as a new corporation, subject to the laws existing at the time of reorganization."

The same point came up in the second case, which was a suit against the St. Louis & San Francisco, which was violating the general railroad law of Arkansas by charging high rates on one of its branch lines in that state. Here the company attempted a defense exactly on the lines of that made by the Norfolk & Western. It showed that it had purchased this branch line from a previous corporation which was created under the laws of 1880, and, therefore, free to charge a much higher rate than that allowed by the present law, which dates back to 1887 only. In setting aside this defense the Court merely refers with renewed emphasis to the broad principal laid down in the last case, and which we have just stated.

It is evident that this principle has important applications in this present period of reorganization of such a large number of our railroads. Its effect will be certain to bring the new companies which take up the old ones under foreclosure more under the power of the law as regards the control of their traffic charges. The legislation of our states has moved very distinctly during the last ten years towards stricter limitation of the power of railroads in this direction, and much of the liberality which marked the charters of these roads cannot be reproduced for their successors. This is particularly true of some western roads, such as the branches of the Union Pacific and the Northern Pacific, and the Reading, and the New York & New England in the East. The principle governing these cases is not a new one, but its present applications far exceed in importance those which have come up in past years.

But a second, and equally important, point, was also raised and decided in the suit against the St. Louis & San Francisco. The railroad made another and stronger defense, on the ground that at any lower rate of passenger charges it could not earn its fixed charges on the branch line, and, in fact, would operate it at a loss. To compel the company to lower rates would thus be, in the language of the state constitution, "the unreasonable taking of private property for public use without compensation," and as such was in violation of this constitution and of that of the United States. This seemed, on its face, a good argument.

But the court decided that, in estimating a reasonable rate, the whole railroad system operated by the company should be taken into account and not merely a single branch line. If the lowering of rates is unjust, it must be so because it diminishes too greatly the revenues of the system as a whole, and not because it makes the company operate the particular branch at a loss. In accordance with this principle, all the lines of the company in the state of Arkansas were taken into account, and it was found that the lower rates had not an unjust effect on the earnings of the system as a whole, although it was admitted that they impaired the value of the branch line. The court, therefore, held that the statutory rates were reasonable, and, as such, must stand.

This again is clearly a decision bearing on a great many actual cases which must constantly arise. The exact value of branch roads to the main lines of any railroad sysem is always a difficult matter to determine. There has, of course, been a marked tendency, during the last ten years, towards the accumulation by large lines of innumerable small branches, and this tendency has been enhanced by the action of the Interstate Commerce law and some State legislation. Such laws, as well as the general industrial and financial situation, have tended to make it impossible for small lines to keep up a struggle for existance and they have largely been swallowed up by their stronger neighbors.

In a great many cases these lines thus acquired, although they have to be operated at a loss, more than pay for themselves by acting as feeders for the main system. But when a company has recklessly absorbed a lot of small branches, and finds that half of them fail to act as feeders, and then tries to make them self-supporting by stiffening the rates on them, it is all of a sudden confronted by the principle which the Supreme Court has laid down in this case, and the State Legislature steps in and cuts down rates without mercy.

It makes no difference that the particular branch line may once have been an entirely separate road, for the rule determines that the reasonableness of a rate is to be tested by its effect on the income of the whole system within the state limits, and not by the disaster it may cause to the one division to which it is applied.

Organization of the Prussian State Railroads.

Prussia has long been famous for its various administrative corps, which are among the oldest in the world, and are regarded as exceptionally efficient. Though in this country the pay would be regarded very small, the positions are much sought for in Prussia, and men of high culture and good families compete for them. It is an honor to belong to them, and a position once secured, the holder is usually provided for for life, receiving a pension after his retirement.

Any system of administration in a country with so much experience with administration as Prussia possesses deserves attention. It has just changed the organization of its railroad administration. The following imperfect account of it is based chiefly upon the official programme of the change and the speech of the Minister of Public Works advocating it before the Prussian Diet.

The old organization of the Prussian State Railroads was adopted directly after the formation of the great system of State Railroads, going into effect April 1, 1880. It aimed at decentralization and personal responsibility. At that time there were 17,502 miles of railroad in the system, at the head of which was the Minister of Public Works (Maybach), while the working of the lines was entrusted to eleven "directories," and to 75 "operating bureaux." Complaints made against the decisions and proceedings of the directories were decided by the Minister. Aside from the matters for which his approval was required by law, only those in which uniformity is necessary were made subject to the Minister's action.

The directories in like manner decided complaints against the proceedings of the operating bureaux, and had original jurisdiction in certain matters in which uniformity throughout the lines subject to them was

regarded important, such as time-tables, rates, accounts, supplies, rolling stock, etc.

The operating bureaux thus had independence and initiative for a large part of their duties, and their action needed approval from higher authorities only when it proposed a variation from the general regulations. Each bureau worked an average of 217 miles of railroad.

Each "directory" consisted of a "President" and a body of administrative and technical officers, distributed into three departments. each having a chief. The first department had charge of the accounts, legal matters and general business; the second department of traffic and operation, and the third of construction and shop administration. The distribution of business among the departments was made by the President in accordance with schedules issued by the Ministry, while the chiefs of departments assigned the work to the several officers in those departments, according to schedules approved by the President.

The chief of an operating bureau was an "operating director," with whom were associated the requisite number of officers and assistants. The chief was responsible for the conduct of business, and distributed the work among the other members of the bureau.

This organization was adopted when a great many private railroads had recently been acquired by the state, and with the expectation that matters not requiring uniformity of treatment would best be left to local officials familiar with the local circumstances and the individual employees. The cost of the greater force required, it was thought, would be offset by greater economy in operation.

Fourteen years' experience with this organization convinced the ministry that it did not do all that was expected of it, especially with regard to economy. Comparison with the administration of the Alsace-Lorraine railroads, which are the property, not of a single state, but of the whole empire, in which no local administration like the "operating bureau" has ever existed, but the directories work the lines directly, convinced the authorities that the Prussian administration was too much divided. The division of authority between operating bureaux and directories greatly increased the clerical work and delayed the conduct of business, and the effectiveness of each was reduced by its relations with the other.

In consequence of this a new organization was planned and proposed to the Diet last year by the present Minister of Public Works, Thielen, and, having been adopted, went into effect April 1 last, the beginning of the Prussian fiscal year.

The new organization, as has been heretofore noted, differs from the old chiefly in the dissolution of the operating bureaux. The officials who do the work corresponding to that heretofore performed by the members of these bureaux have no longer independent administrative authority, which is now concentrated in the 20 directories (instead of 11, as heretofore), under whose direct orders the subordinate operating officers, corresponding most nearly with our division officers, act. The new directories have charge, on the average, of 870 miles of railroad. Each consists of a President and a staff of administrative and technical officers, the duties of each of whom are assigned by the President, who will be responsible for the directory's work. As a rule, the officials of a directory will not be divided into departments, as heretofore. Certain matters, requiring uniformity for the systems of two or more directories, will be attended to by one of the directories for the whole group; and in some cases a single directory may be assigned to the charge of affairs concerning the whole state railroad system—such as the procurement of rolling stock and supplies, the distribution of cars, shop management, etc.

To each President is assigned one official of high rank of the class called "administrative" (whose preliminary training is usually legal, but his whole experience in state administration), and one of the technical class, who will represent the President in his absence, and in certain subordinate affairs even when he is present. Their opinion is to be heard in all important matters. These men are selected for their efficiency, and with little regard to seniority in the official hierarchy.

For the operation and superintendence of the road the lines of a directory will be divided into "inspections," a "construction and operation inspection," averaging about 100 kilometres (62 miles), a "locomotive inspection" 186 to 310 miles, and a "traffic inspection" 124 to 248 miles. There is but one Telegraph Inspector for the whole system of a directory.

The new organization enables the ministry to dispense with no less than 3,050 employees, including 380 higher officers, 2,180 intermediate and 60 lower officers, and 430 laborers.

The whole staff of officers attached to the 20 directories numbers 324, of whom 149 belong to the class called administrative, while the others are engineers—110 civil engineers engaged in the operating department and 12 in new construction, and 53 mechanical engineers. This is an average staff of 16 per directory, working an average of 870 miles of railroad.

The "inspectors," whom we have likened to our division officers, have salaries ranging from $900 to $1,350 per year, besides certain allowances. An advance in salary is made every three years, until the highest is reached after 15 years service in the grade. A part of these inspectors may be honored with the title of "Councillor of the Fourth Class." The American reader should carefully avoid estimating the importance and desirability of these positions by the salaries on our standard. The men who occupy them have a high standing in the community and deserve it.

Each directory have an accounting and an auditing office, with a "Director of Accounts," to whom the Auditor is subordinate, at the head. The force under these officers is not diminished under the new organization, but considerably increased. Special effort has been made to simplify the accounts and make them effective, and secure independence to the accounting officer. An increase in the force in the Ministry of Public Works is required, and an Assistant Minister is provided having charge of routine business.

The saving in salaries and wages is estimated at $1,500,000 per year; but for the first year this is offset by an allowance of $900,000 to the superfluous employees who have been discharged.*

Annual Reports.

Norfolk & Western.—In writing last February of the Norfolk & Western receivership we said "in general terms the receivership is the result of a policy which might have been a successful one in prosperous times, but which was a very dangerous one and almost sure to lead to failure in times of great depression. . . . That policy was to extend the system and especially to build up a great mineral traffic." The figures of the annual report for the year ending Dec. 31, 1894, which has just been published, are an amplification of this general statement. By way of showing how the system has grown and how, with increased earnings, the net earnings have fallen, the figures in the table below have been compiled:

	1894.	1893.	1892.	1891.
Miles operated.....	1,567	1,556	1,308	1.091
Gross earnings.....	$10,340,452	$10,032.618	$9,052,882	$9,188 042
Working expenses..	7,693,905	7,199,460	7,031.673	6,009,767
Net.....	$2,646.547	$2,833,157	$2,921 209	$3,178,274

The year 1891 was the year of greatest net earnings. The gross and net earnings per mile for six years, the period covering the policy of extension, are shown in the following table:

	Miles.	Gross.	Net.
1889	591	$9,471	$3,577
1890	826	9,155	3.297
1891	1,091	8.422	2.913
1892	1,308	7,609	2.233
1893	1,556	6.448	1.821
1894	1,537	6,599	1,690

The gross and net earnings reached their maximum per mile in 1889, when the miles operated were only 591. Since that time both have declined, and meanwhile fixed charges have been growing. This is exhibited in the table below:

	1894.	1893.	1892.	1891.
Interest.....	$3,026,865	$3,009.218	$2,428,454	$2,266,131
Rentals.....	80,613	64,871	47,308	.....
Total	$3,107,509	$3,074,089	$2,475,761	.....

Obviously this sort of thing could not go on forever, and in fact the end of 1894 showed a deficit of $618,392. The principal results of operation in that year were as below:

Gross earnings	$10,340,452
Working expenses and taxes	7,693,905
Net earnings.....	$2,646.547
Other income.....	135,585
Total income.....	$2,782,132
Interest and rentals	3,107,509
Deficit.....	$325,376
Advances to leased lines	147,715
Purchase of equipment bonds.....	145,300
Total deficit.....	$618,392

The gross earnings increased 3 per cent. over 1893. The working expenses and taxes increased 7 per cent. and the net earnings decreased 7 per cent. Under such conditions, with diminished net earnings, increased working expenses and fixed charges, in a time of general business depression, the company found itself with new work on hand that must be completed or interest on the money already invested in this work lost. So the Ohio line was pushed on and opened in November, 1892, but a floating debt of some three million dollars had been incurred. Then the new line would still fail to earn revenue without additional rolling stock, which was bought under car trusts maturing through periods of from three to 10 years. In 1893 the company sold securities to liquidate its floating debt and provide for other capital requirement, but the money raised was not sufficient in face of diminished earnings to meet the needs of the year, and at the end of that year there was still a small floating debt. In 1894, again, the earnings were insufficient, and the company came out of the year with a deficit of over $600,000 and a floating debt of over a million.

The growth of the obligations of the company for the last four years may be seen in the table below, where the amounts of the various obligations are shown in millions and decimals of millions:

	1894.	1893.	1892.	1891.
Capital stock.....	$59.500	$57.500	$52.500	$19.500
Funded debt	50.929	50 6 6	54 770	50.943
Equipment obligations	7 647	7 867	2,52	0.533
Unfunded obligations	3.0	2.100	5.0	4.100
Total.....	$121.076	$118.373	$114.690	$105.076

The total obligations per mile are now less than $80,000, which surely is not a hopeless load for a railroad in the Eastern states, reaching a great seaport and running through one of the best coalfields in the country. This railroad is generally reputed to be in a good physical condition, which is probably true. It certainly has an intelligent and competent engineering staff, both civil and mechanical, and much money has been spent in recent years, not only in new construction, but in betterments of the old track and in improvement of the rolling stock. The rolling equipment now consists of 0.26 locomotives per mile, 0.16 passenger cars and 11 freight cars, which is considerably above the average of the United States. The earning capacity of the road is large, but it is afflicted with extremely low rates, and probably always will be. The average ton-mile rate in 1894 was 0.451 cents. The year before it was 0.514, and in 1894 0.537. In fact, as we go back through the years, this rate has steadily fallen. So, in spite of greater tonnage and greater ton mileage, the gross earnings fell, while the longer haul and greater volume of traffic increased operating expenses without a corresponding gain in revenue. That this must long be so seems likely from the conditions under which this railroad works. The great volume of its traffic is coarse freight; in fact, last year 85 per cent. of its freight traffic was minerals and lumber, much the greatest part of its tonnage being coal and coke. For this traffic the road has powerful competitors, well equipped, some of them working on shorter lines, with very advantageous grades and serving coalfields of the first class. Under such conditions a considerable increase in rates is out of the question.

On the whole the property is a good one, but it is one which will require most careful and skillful operation and management. The proposals for reorganization involve an assessment of the stock sufficient to pay off the car trusts and floating debt and scaling of the interest on the more recent issues of bonds, and we should suppose that the security holders would find it desirable to reorganize on this basis.

Southern Pacific.—The annual report of the Southern Pacific Company, for the year ending Dec. 31, 1894, has recently been made public. The total mileage operated, proprietary and leased lines and affiliated companies, is 7,911, an increase of 43½ miles since 1893. In addition to this it is of course well known that the company operates water lines aggregating about 5,000 miles.

The principal results of the operation of the system compared with 1893 are as below:

	1894.	Decrease per cent.
Gross earnings.....	$50,918,157	5.9
Working expenses.....	33,331,278	4.2
Net from operation	$17,586,879	9 5
Rentals, etc.....	684,683	
Total.....	$18,271,562	9.1
Taxes, rentals, interest, etc.....	16,595,963	8.4
Surplus over fixed charges.....	$1,675,598	18.2
Other income	912,387	
Balance over fixed charges.....	$2,587.985	5.7
Betterments and additions charged to capital.....	1,258,018	19.3

The surplus, after charging off betterments, etc., and crediting a small amount chargeable to leased lines, remains $1,474,788. The passenger earnings decreased 11.3 per cent., as a result of the business depression and of a decrease in rates. The rates averaged 1.946 cents per passenger-mile against 2.144 in 1893. There was a considerable increase in the ferry-suburban passenger business, namely, 7.25 per cent. in mileage. The earnings from commercial freight fell off 6.23 per cent., attributable both to diminished volume and to lower rates. The ton-mile rate averaged 1.171 cents, against 1.372 in the preceding year. So, while ton-mileage increased, the earnings fell off. The volume of local freight declined seriously, namely, 14.16 per cent. in ton miles, and 16.15 in earnings. The principal factor in the loss of freight earnings is said to have been the diminished wheat crop and the low price. The export of wheat from San Francisco was the smallest since 1877.

Mr. Huntington considers the result of the year's work as gratifying under the unfavorable conditions and as demonstrating the advantageous location of the company's lines. In speaking of the possibilities of the country traversed he mentions an interesting fact. West of Yuma, in what has been known as the Colorado Desert, 600,000 acres of land were bought in 1893, by a syndicate, at $2.50 an acre. The owners are now arranging to bring water to that tract from the Colorado River and it is believed that in the near future the land so irrigated will sell at from $25 to $75 an acre, as all the semi-tropical fruits and many from the temperate zone may be readily cultivated there. He foresees great possibilities also in California itself, and especially in the great San Joaquin and Sacramento valleys.

The president gives some very interesting information as to the probable future development of the country served, and concludes with a comparison of the rates of

* For some account of the training of German railroad officers see the *Railroad Gazette* of Sept. 7, 1894, p. 619.

his system with those obtained in the state of Massachusetts. As stated above, the passenger-mile rate was 1.94 and the ton-mile rate 1.17. But from the 1894 report of the Railroad Commissioners of the state of Massachusetts it appears that the passenger-mile rate in that state was 1.8 and the ton-mile rate 1.33. Mr. Huntington says: "When the difference in the density of the population and traffic is considered, as shown in the passenger travel, which is as 6.28 to 1, a fair estimate may be formed of the excellent physical condition of these properties and their facilities, as they made it possible for the company to carry passengers and freight at such low rates as those mentioned above without having to seek relief in the courts."

We note that the company has ordered for delivery by July, 1895, 40 locomotives. Eleven of these are 22 × 26 in., 12-wheel engines; 20 of them are 20 × 26 in., 10-wheelers, for passenger and freight service; 3 are 19 × 26 in., 10-wheelers, also for passenger and freight; and 6 are 19 × 24 in., 8-wheel, passenger engines. Eighteen first-class passenger cars and 1,300 30-ton box-cars have also been ordered, these latter equipped with air brakes and automatic couplers.

Expenditures for betterments and additions on the lines of the proprietary companies since the Southern Pacific got control have amounted to $13,306,000, none of which appears in the bonded debt.

The Stresses in Car Axles.

Concluded from page 316.

Conclusions. (*a.*) The loads required to break a car axle, or to deflect it until the outer or most strained fibre has reached the elastic limit, are about 30 or 40 per cent. greater than the common calculation gives, and this is one of the reasons why the real factor of safety over and above the normal load is greater than the apparent factor, and this explains why axles break less frequently than might be expected from the loads that they are intended to carry.

(*b.*) The stresses that are put on the M. C. B. axles are not excessive for a quiet load, but as the load oscillates vertically the stress is often at least double that due to the quiet load, and, therefore, is greater than it is safe to allow for long continued service. Particularly is this true in view of the fact that there is no way of securing perfectly uniform material so as to be sure of the real strength of the axle, nor is there any certainty of determining the maximum stress to which axles are subjected. Further than this, the wear of the journals reduces the strength of the axle, and thereby the fibre stress is increased, as is clearly shown by the diagram.

(*c.*) The M. C. B. standard axles are subjected to a greater repeated maximum fiber stress at the middle than at the journal neck, by the journal loads alone, as may be seen from the diagram. If the flange loads were included, the stresses given by the calculations for the middle would be much greater. An increase in the size of the middle does not interfere with interchangeability, and therefore to gain strength the axles may be made straight from wheel seat to wheel seat. But it would be better to increase the wheel seat and use the same taper form as at present, but of larger dimensions. The taper form is the correct one, owing to the fiber stresses from the flange loads, as is pointed out in what precedes, and the slope may be taken as correct when it is the same as the present standards. With this slope the middle of the axle is generally more strained than any other part between wheels, and when this point is made strong enough the axle will be safe at all points between hubs.

(*d.*) The wearing of the journals from the standard size down to the limit fixed upon by the Rules of Interchange reduces the strength of the 3¾ × 7-in. journal about 37 per cent., and the 4¼ × 8-in. journal about 31 per cent. An increase in the diameter of these journals of ⅛ in. raises the strength 45 per cent. for the 3¾ × 7-in. journal, and 39 per cent. for the 4¼ × 8-in. journal, as is shown on the diagrams, Figs. 6 and 7. It would appear from this investigation that the 4¼ × 8-in. journal is none too large for 40,000-lb. capacity cars, and this is evidence of the wisdom of those who are using the 4¼ journal on all cars rated at 40,000-lb. capacity and above.

(*e.*) The load from rolling oscillation occurs less frequently, and is almost always less in amount than that from the vertical oscillation, and, as both these loads do not generally occur at the same instant, the vertical oscillation alone need be considered when calculating the repeated stress on the center of the axle, or at the journal neck.

(*f.*) In looking for the sudden stresses that cause the initial cracks in steel axles, which lead in the end to a fracture like Fig. 3, the oscillating load, both vertical and rolling, the wind pressure, the centrifugal force on curves and the thump due to the closing of the spring, must be considered. This is an extremely difficult condition to calculate about, even approximately, as so much depends upon the stiffness of the body and truck bolsters and the side frames, and upon the simultaneous occurrence of these loads.

Breakages from initial cracks seldom occur at the centre of the axle, and, in fact, are almost never found except at the neck of the journal. It is reasonable to suppose that this is due to the sudden change of form at this point which causes a concentration of the bending action. To avoid this as much as possible the journal should be large and have a large fillet at the inner end, and the material should be as strong and tough as it is practicable to buy. Iron does not break in this way, but is so much weaker that it is liable to break off completely at this point with a single heavy stress after having been some time in service.

To reduce the stress at the neck of the journal that is caused by the thump due to the closing of the springs, and this is by far the largest of the individual stresses that go to make up the total stress, the spring should have considerable motion remaining after the load is applied. Many loaded cars in this country have less than three-fourths of an inch additional motion before the springs close, and this is too little for the common oscillation produced by the ordinary track.

(*g.*) As to the best material for axles; this is a matter that depends somewhat upon the ability of a purchaser to control the material. It often happens that for commercial reasons, such as securing freight and the encouragement of local industries, railroads prefer to purchase in such a way that competition in quality is practically prevented, and not often it happens that it is impossible even to get more than one kind of material, that is, either iron or steel. In such cases, the kind of material is fixed upon by conditions foreign to scientific considerations. Generally, however, the intrinsic value of the material in quality can be regulated no matter where the axles are purchased, provided the shop is equipped with the proper furnaces and hammers. There is no excuse for any railroad buying poor iron or steel axles, as the real cost of the best grades is but little more than the cost of the poor grades, and the price of the best need not be, and is not, so high as to be a hardship on the purchaser. If any railroad company gets poor material in axles it will be the result of poor inspection, for it is a simple matter for an experienced inspector, of which there are a great many, to determine the quality of iron and steel. The cost of inspection is too small to make it a factor in such an important matter. Good inspection does not mean alone the examination of the material after it is made, but includes a close and intimate knowledge of the raw material and the process of manufacture during the time while the axles are being produced.

Good iron is said to wear better than steel for journals, but about this there is too much difference of opinion to permit a conviction. Iron certainly has the advantage of being less liable to break after an initial crack has been started, but as it has a low elastic limit, it is more susceptible to fatigue by repeated bending when of the same dimensions as steel.

Good steel for axles will have a tensile strength fully 60 per cent. higher than iron, and an equally greater elastic limit, and therefore is less liable to fatigue and to initial cracks, and less apt to break under sudden stresses. This is shown by the results of the drop tests, if in no other way.

Both iron and steel, when of good quality, are admirably fitted for axles, but it is unreasonable to suppose that the same minimum dimensions can be used for both, and if the calculations show that a given steel axle is strong enough for a given service it is not logical to put an iron axle of the same dimensions in its place and expect the same degree of safety. If an iron axle of given dimensions is found not to be strong enough for a given load, a large increase in strength can be obtained by putting in a first-class steel axle in its place.

In selecting an axle for a given service the first thing to be done is to examine the conditions of service and determine upon the load to which the axle will probably be subjected, taking full advantage meanwhile of the knowledge already obtained from the vast number of axles that have been used. When the probable maximum repeating load is determined from these practical considerations, then the dimensions should be fixed so that the fibre stress, when the axle is worn down to the limit, is not more than 8,000 lbs. to the square inch for the best hammered iron and 14,000 lbs. for the best steel, as this will only give a factor of safety of two above the strength at which the axle will just resist breakage with an indefinite number of reversals of load. A factor of two is none too high to include the uncertainties in the manufacture of the material, and to most engineers this factor will seem altogether too small, for in bridges for railroads it is common practice to use a factor of five and a fibre stress for steady loads that is smaller than the factor of safety of two gives for the fibre stress in axles for reversing loads. Apparently there is no reason why a car axle should not be made as safe as a bridge, for it is not clear that the materials in axles receive any more attention in manufacture than the materials put into the best bridges, nor are the stresses to which axles are subjected more definitely determined than the stresses in bridges. Probably most railroad men think that we know a good bit less about the maximum loads applied to axles than about those to which bridges are subjected.

To sum up, it is pretty evident that it does not matter whether good iron or good steel is used in axles, but whichever is used, the dimensions must be made according to the material when the conditions of service are the same, and the same dimensions will not give the same degree of safety with both materials. Any approximately safe calculation that may be made by a conservative engineer will show that the present dimensions of the M. C. B. standard axles are not such as will give a proper degree of safety with iron axles under the common conditions of maximum load. The same dimensions with steel axles are safer, but when worn down to the limit the same criticism applies, and both standard axles, when made either of iron or steel, should be larger between wheels.

April Accidents.

Our record of train accidents in April, given in this number, includes 33 collisions, 75 derailments and 9 other accidents, a total of 117 accidents, in which 27 persons were killed, and 90 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS:	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	9	0	0	9
Misplaced switch	2	0	1	3
Failure to give or observe signal	1	1	1	3
Mistake in giving or understanding orders	0	1	0	1
Miscellaneous	4	0	2	6
Unexplained	5	1	5	11
Total	21	3	9	33

DERAILMENTS.			
Broken rail	2	Track repairers	1
Defective bridge	3	Bad switching	1
Defective switch	1	Bad loading	1
Broken guardrail	1	Unfastened switch	1
Soft roadbed	2	Runaway train	1
Broken wheel	3	Animals on track	2
Broken axle	8	Landslide	5
Broken truck	2	Washout	5
Failure of drawbar	4	Malicious obstruction	3
Broken car	3	Accidental obstruction	1
Broken parallel rod	1	Unexplained	21
Misplaced switch	3		
			75

OTHER ACCIDENTS.	
Explosion	1
Cars burned while running	2
Various breakages of rolling stock	1
Other causes	5
	9
Total number of accidents	117

A general classification shows:

	Collisions.	Derailments.	Other accid'ts.	Tot'l.	P.c.
Defects of road	0	9	0	9	8
Defects of equipment	9	21	2	32	27
Negligence in operating	13	8	4	25	22
Unforeseen obstructions	0	16	3	19	16
Unexplained	11	21	0	32	27
Total	33	75	9	117	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other ac'dts.	Total.
Passenger	14	18	5	37
Freight and other	35	57	4	96
Total	49	75	9	133

The casualties may be divided as follows:

Killed.	Collisions.	Derailments.	Other ac'dts.	Total.
Employees	1	16	0	17
Passengers	0	3	0	3
Others	0	7	0	7
Total	1	26	0	27
Injured.				
Employees	18	28	4	50
Passengers	2	15	4	21
Others	0	18	1	19
Total	20	61	9	90

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	9	1	5
Defects of equipment	0	1	2	9
Negligence in operating	0	5	5	28
Unforeseen obstructions and maliciousness	0	1	6	7
Unexplained	3	5	3	1
Total	3	21	17	50

Eighteen accidents caused the death of one or more persons each, and 22 caused injury but not death, leaving 77 (66 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with April of the previous five years shows:

	1895.	1894.	1893.	1892.	1891.	1890.
Collisions	33	37	72	47	67	64
Derailments	75	62	92	86	108	67
Other accidents	9	5	9	10	6	4
Total accidents	117	104	173	143	181	135
Employees killed	17	17	33	30	52	13
Others killed	10	11	2	9	4	2
Employees injured	50	59	93	107	100	81
Others injured	40	29	29	31	49	59
Passenger trains involved	37	30	58	45	53	45
Average per day:						
Accidents	3 90	3.47	5.77	4.77	6.03	4.50
Killed	0.90	0.93	1.17	1.30	1.87	0.50
Injured	3.00	2.93	4.07	4.60	4.97	4.67
Average per accident:						
Killed	0.230	0.269	0.202	0.272	0.309	0.111
Injured	0.769	0.846	0.705	0.972	0.823	1.037

The record of disasters on railroads is again quite moderate, although, as in March, there is a slight increase in the number of accidents over the previous year. The number of passengers killed in April was only three, but even this is larger than the average per month for the past eight months, which has been only 2.75. The three passengers were all killed in one accident, a startling derailment on a narrow gage road at Whigville, O., on the 5th. The road does a very small business and the brevity of the list of victims is due to the fact that there were but very few persons on the train.

April is usually one of the lightest months in the year, but even the lightest month generally has startling accidents enough. On the 1st, a runaway freight train on the Boston & Albany got to going at such a furious speed that the piston rod guides on the locomotive gave way. As this was a freight engine, with small driving wheels, and as the accounts say nothing about injury to

the rails, the mishap affords incidental evidence of the stiffness of the Boston & Albany rails, as the train probably ran considerably faster than 70 miles an hour.

The butting collision at Veazie, Me., on the 2d, has already been referred to in the *Railroad Gazette*. We understand that the rules of the Maine Central require a blue *and a red* signal to be displayed to stop trains for orders. The tramps "opened the season" near Alton, Ill., on the 5th, 60 of them tumbling out of a freight train which ran off the track. If these trespassers had not been there the record of fatalities in April would have been 15 per cent. smaller. The derailment near Remini, S. C., on the 13th, shows how well an oil car can spread a fire under favorable circumstances; the tank car which was torn open by the broken axle ran about 500 ft. after the oil began to spill, so that when once the fire had been started there was a line of oil to convey it rapidly throughout the length of the train.

The electric railroads continue to do their share for the accident record. A butting collision near Gloucester, N. J., was reported in the *Railroad Gazette* of April 19. Near Pittsburgh, on the 5th, an electric car carrying some laborers—a work train, in fact—fell down a 25-ft. bank and two of the men were killed. The car landed on the tracks of the Baltimore & Ohio Railroad. It is said that the foreman was arrested for having told the motorman to increase the speed of the car. A switching engine ran into an electric car in Philadelphia on the 29th. At 138th street, New York, on the 30th, an electric car was stalled on the crossing of the New York Central by the failure of the power. The highway crossing bell was ringing at the time, indicating that a train was approaching, and the passengers rushed for the door so excitedly that a boy was trampled upon and injured. The current returned and the car started just in time to escape an express train.

Near Donaldsonville, Ala., on the morning of April 30, a flagman, who had fallen asleep upon the track, was killed by the train which he was sent to flag.

The punctuality of passenger trains has again been made the subject of a special return to Parliament by the British Board of Trade in response to an order adopted at the instance of Sir Frederick Fitz Wygram. The statistics are for June, July and August, 1894, and are taken from the conductors' reports. They are for trains which had traveled a distance of at least 50 miles; and they show the total number of trains, the percentage which arrived on time or not more than five minutes late, the percentage 6 to 10 minutes late; 10 to 20; 20 to 30; and over 30 minutes late. We have condensed these tables, omitting the second, third and fourth columns, and print them below.

PUNCTUALITY OF LONG DISTANCE PASSENGER TRAINS ARRIVING IN LONDON, 1894.

A, number of trains; *B*, percentage of trains arriving on time or not more than five minutes late; *C*, percentage arriving over 30 minutes late.

	June.			July.			August.		
	A.	B.	C.	A.	B.	C.	A.	B	C
Great Western.	1,126	50	1.3	1,151	49	3.1	1,196	31	7.0
L & Southwest'n	1,107	63	1 2	1,212	50	1.6	1,212	42	5 8
L., B, & S. C., Victoria.....	1,161	47	2.3	1,365	34	6.4	1,313	23	13.2
L., B. & S. C., London Bridge	1.352	64	1 8	1,509	55	4.1	1.513	39	8.0
S. E., L. Bridge.	812	82	0.3	898	74	0 9	890	61	1 1
S. E., Canon St..	816	80	0.2	903	70	0 8	891	60	2.2
S. E., Charing C..	868	61	0.4	955	46	2 0	946	38	3.5
L., C. & D., Vic..	576	59	2.3	645	33	6 8	630	42	6.8
Ditto, Holborn....	550	42	3.6	619	20	10.5	604	24	12 3

The London, Brighton & South Coast adds to its statement a list of race days, excursions and other events which caused delay to passenger trains. Among these are a case of another company's train off the track at a junction, and a London fog which lasted three days. The South Eastern and the London, Chatham & Dover leave out of account the trains which connect with boats from the continent. The Great Western calls attention to the fact that its figures include some trains traveling from Penzance, 325 miles; New Milford, 285 miles and Birkenhead, 229 miles. The Northwestern, the Great Northern, the Great Eastern and the Midland appear not to have been included in the inquiry.

The sixth annual report of the British Railway & Canal Commission has just been printed. The Commissioners are three judges (ex-officio), Mr. Collins, Lord Trayner and Mr. Murphy, one each for England, Scotland and Ireland; Sir Frederick Peel and Viscount Cobham, five in all. The report itself is very brief and perfunctory, the principal part of the pamphlet being taken up with an appendix containing a list of the 33 cases that have been before the Commission during the year (ending Dec. 31, 1894). This statement presents quite a full description, for an index, but it is not full enough to give the reader any information of value concerning the merits of the cases, or the character of the decisions. A good many of the cases are applications for orders to prevent discrimination, which are reported as having been dismissed. One or two points of interest may, however, be noted. A company owning what Americans would call private cars complained that the Great Western Railway discriminated against it. The case was settled by agreement before the hearing had been finished, and the defendant railroad agreed to pay the complainants £300 toward their costs, which would seem to indicate that the railroad company was beaten. In another case involving the use of private cars, it was held that the rates on such cars should be proportioned to transportation rates and not to mileage. The Town Council of Maidstone secured an order directing the South Eastern and the London, Chatham & Dover Railroads to sell through tickets to certain sea coast resorts over the joint line of the two companies. The same order requires the companies to afford facilities for through freight and parcel traffic, and freight cars containing not less than *one ton* each, must be sent through without transshipment. The Commissioners approved five working agreements between railroad companies.

Mr. C. S. Wight, General Freight Agent of the Baltimore & Ohio at Pittsburgh, who was tried in the United States District Court at Pittsburgh last week for granting illegal rebates on freight shipments, was found guilty by the jury on May 15. The case will be appealed to the Supreme Court. The rebate on which this suit was based was made to F. H. Breuning, of Pittsburgh, who received beer from Cincinnati in 1892, and was allowed 3½ cents per 100 lbs. for cartage. The witnesses on the part of the road admitted the facts, stating that this allowance was made to compete with the Pittsburgh, Cincinnati, Chicago & St. Louis, whose station was near Mr. Breuning's store, while that of the Baltimore & Ohio was a long distance away. It appeared, however, that another receiver of beer in about the same locality paid the regular rate from Cincinnati to the Pittsburgh depot and bore the expense of cartage himself. Mr. Breuning had paid the bills at the station in the regular way, and then presented a claim for the cartage at the end of each month, which was paid. In four months the rebate amounted to $2,500. J. T. Leel, who was Contracting Agent for the road at Cincinnati in 1892, and who has since left the service of the road, furnished most of the evidence. This week it is announced that Mr. Wight has been granted a new trial.

The accident report of the British Board of Trade for the year 1894 has just been issued. Sixteen passengers and 6 employees were killed by train accidents during the year and 347 passengers and 62 employees injured. The lists of casualties from other causes, including persons at grade crossings and trespassers, bring the totals up to 1,115 persons killed and 420 injured, an increase of 104 killed and 11 injured over the previous year. Fourteen passengers were killed in a single accident—that at Chelford, Dec. 22. The special reports of the inspectors of the Board on the more prominent accidents, which have not been very numerous for the last year or two, resume their former importance in this report, there being 24 of them, filling 150 pages; and four of these reports are accompanied by large diagrams of the scenes of the accidents. A collision occurred July 9 on the Metropolitan Railway at Baker street, in which it was claimed that Spagnoletti's lock and block apparatus was at fault, and Major Marindin's report on this accident is accompanied by a diagram of the electrical apparatus, and a special report by Major Cardew, who appears to be the electrical expert of the Board.

Press despatches report that up to last Saturday 280 canal boats had cleared at Buffalo for the East this season, though it does not appear that there has been any improvement in grain rates. For the corresponding period of last year the number of clearances was 495. The rates on grain to New York have been two cents a bushel, 1⅞ cents and down even to 1¼ cents, very few boats getting as high as two cents. The boatmen reiterate their statement that when they carry grain at any rate lower than three cents a bushel they lose money, but some of them claim that, like the railroads, they will lose still more money, if they let their facilities lie idle, than if they take freight at less than cost. On the return trip they get some freight at from 45 cents to 75 cents a ton. With a return load added to the 50 or 60 cents a ton received on the load of grain eastward they say they can earn their board and clothes for a time; but how many of them can get a return load does not appear.

We told you so. The citizens of Brooklyn are now complaining because the electric street cars in that city do not go fast enough. The prescribed rate of speed in the most thickly settled part of the city is six miles an hour, but the complainants claim that the companies are reducing this to three and four miles an hour, out of spite. According to the newspapers, petitions have been signed by 20,000 people to have the restriction removed. Those who originally secured the establishment of the restrictive regulations, on the ground that the numerous fatal accidents to pedestrians were injuring the reputation of the city, retort that 200,000 would quickly sign a petition to have the low speeds continued, and so the city government is in a dilemma.

NEW PUBLICATIONS.

Report of the Massachusetts State Board of Health upon a Metropolitan Water Supply, February, 1895.

Twenty-fifth Annual Report of the State Board of Health of Massachusetts.

One habit which characterizes the administration of the old Commonwealth of Massachusetts is the free use made of sound engineering advice in matters connected with public works, and this we take it is one of the signs of high civilization in any community. The report on metropolitan water supply now before us is a good example of this trait. The body of the document is the report of Mr. F. P. Stearns, Chief Engineer of the Board, who has prepared a statement of the present and future resources of water available for the metropolitan district, with details as to reservoirs, aqueducts, pipe lines and pumping stations. Mr. Joseph P. Davis, acting as consulting engineer, has examined this report, and his brief report endorsing it appears in the volume. A report from Mr. Dexter Brackett on the Present and Future Consumption of Water in the Metropolitan District, appears in an appendix. Another appendix is a report on the Improvement of the Quality of the Sudbury River Water by the Drainage of Swamps, by Mr. Desmond FitzGerald. Still another is An Examination of the Organic Matter in Soils and its Bearing on the Storage of Water by Reservoirs, by Dr. Thomas M. Drown; and another is a report on Water Supplies of Different Qualities for Different Purposes, by Dexter Brackett. The whole makes up a volume of 233 pages, with many maps and plans, all carefully indexed, the alphabetical index filling 8¼ pages.

The Board recommends that some 28 cities and towns, with a population of 848,000 should constitute the metropolitan water district, but that some 11 cities and towns, aggregating 210,000 people, which believe that they have a sufficient supply for some years to come, should not be provided from the metropolitan supply until they formally express their wish for it. The Board estimates, however, that those towns will demand this improved supply much sooner than the towns now anticipate.

Three principal sources were critically examined; Lake Winnipiseogee in New Hampshire, the Merrimac River above Lowell and the Nashua River above Clinton. The Lake Winnipiseogee supply would be ideal as a perfect source of pure water, but the expense of bringing and distributing this water would be $34,000,000, not including damages from diversion of water and charges incident thereto. The Merrimac supply is polluted and the cost of filtering it and conveying it to the metropolitan district is estimated as $17,500,000. It is the opinion of the Board that it will be better to pay 10 per cent. more for a supply from a source that has not been polluted, and an entirely satisfactory supply is found in the Nashua River above the city of Clinton. The estimated cost of the works necessary to supply from this source all the communities of the metropolitan district for the next 10 years with the main part of the works of sufficient capacity for a long future, is a little over $19,000,000. The cost for the full development of this supply to yield 173,000,000 gallons a day and distribute it to all the cities and towns in the metropolitan district would be $25,378,000.

The 25th Annual Report of the Board of Health is for the year ending September 30, 1893, and includes vital statistics, advice to cities and towns concerning water supply and sewerage, examination of water supply and of rivers, special reports by Dr. Drown on Organic Matter in Soils, by Mr. George W. Fuller on Purification of Sewage and Water at the Lawrence Experiment Station; on Filtration of Sewage and of Water, by Mr. Hiram F. Mills; on the Filter of the Water Supply of the City of Lawrence; on Sewage Purification of the Cities and Towns of Massachusetts, and on the Precipitation of Sewage at the World's Fair. There are still other special reports and collections of statistics, and the whole volume has a good index.

In passing it is interesting to note that the death rate in Massachusetts does not appear to have fallen in the last 10 years in spite of the intelligent work of the Board of Health, which fact may possibly be accounted for by the steadily increased population in the cities and large towns. The death rate from 1883 to 1892 inclusive, was 19 7 per thousand in Massachusetts. In England for practically thes ame period it was 19.1. Yet the decreased mortality from special diseases in the last 20 years is remarkable. The rate per 10,000 from scarlet fever fell from 9.4 in 1873, to 2.8 in 1892. The deaths per 10,000 from typhoid fever were 8.9 in 1873, and 3.5 in 1892. The deaths from diphtheria and croup seem to have been abnormally few in 1873 and 1874, when they were 4.7 and 5.6 in each of the two years; then for 7 years they ranged from 11.4 up to 19.6. Since that time the rate has, with some fluctuations, fallen to 5.3 in 1891 and 6.1 in 1892. The death rate from pneumonia has increased, possibly from more accurate diagnosis; so have the deaths from cancer, from kidney diseases, from heart diseases and from brain diseases. In 1873, for example, the deaths per 10,000 from brain diseases were 16.9; in 1892 they were 21.2. From heart diseases they were 7.9 in 1873 and 15.7 in 1892. From kidney diseases they were 2.9 in 1873 and 6.5 in 1892. These, of course, are the kinds of diseases the mortality of which increases with the intensity of life, and which probably can be but little mitigated by general sanitary regulations. And so it is that the reduction of the death rate by successful work on the causes of poison diseases is neutralized by the increase in the classes of diseases that cannot be reached by the State.

Results of Tests Made in the Engineering Laboratories of the Massachusetts Institute of Technology. Part I. Applied Mechanics. Reprinted from the Technology Quarterly.

This pamphlet contains illustrations of the apparatus used in testing beams, ropes and specimens in tension, torsion and compression. There are tables giving the results of the tests of wrought iron, steel and cast-iron in tension and compression; of phosphor bronze and aluminum in tension; several kinds of annealed and galvanized iron wire in tension; hard drawn and soft copper wire in tension; refined and Norway iron and steel in torsion; manilla and cotton ropes, both wet and dry, in tension; spruce, yellow pine, kiln-dried Western white pine, ordinary white pine, hemlock and white oak beams, in crushing, tension and shearing, independently and combined. Also are added time tests of wooden beams, in which the load

was applied during several months. From this list of subjects an engineer can see that the pamphlet contains much useful information. That it has been carefully collected under as nearly as possible practical conditions, will be understood from the fact that the work has been done under the direction of Prof. Gaetano Lanza, whose investigations of the strength of timber are recognized as very important. His results were the first to teach that the strength of wooden beams is often limited by the resistance to longitudinal shearing. This pamphlet can be obtained by addressing the Massachusetts Institute of Technology, Boston.

The Journal of the Association of Engineering Societies for March has a long table of contents which looks interesting. The articles which appear to us especially important are on the Use of Steel in Large Buildings, by Mr. Corydon T. Purdy, and Railroad Signaling, by Mr. Charles S. Churchill. There is also an article of considerable interest by Mr. Isham Randolph, being the introduction to a series of articles on the Chicago Sanitary District Canal, which will be written by engineers employed on that work. Mr. Purdy's paper is a review of the introduction and spread of steel construction in large buildings, with a good deal of valuable information drawn from his own large experience. Mr. Churchill's paper is a general review of the subject of signaling, written apparently for the purpose of informing the general railroad man broadly as to the present state of the art. Of course an article of 16 pages must be very general, but the review of the subject is useful. In the discussion Mr. Soule contributes some interesting facts as to the early history of interlocking in this country.

The Quotation Supplement of the Commercial and Financial Chronicle. The William B. Dana Company, New York.

With its issue of May 11 the *Commercial and Financial Chronicle* begins the publication of a monthly Quotation Supplement. This supplement will give each month a review of the market for the preceding month. This will be followed by quotations and sales of the securities listed on the New York Stock Exchange, giving for the bonds, interest periods and sales. Then follow tables of all classes of securities. The publishers say that what future issues will contain will be determined by what the future calls for. The first issue, at any rate, is very complete and convenient.

TRADE CATALOGUES.

The Nordberg Corliss Engine.—This is a pamphlet 6½ × 10 in., containing 33 pages describing and illustrating the Corliss engines and various specialties made by the Nordberg Manufacturing Company of Milwaukee, Wis. It contains two full-page photoengravings of the Corliss engine with very complete detail drawings of the different parts and foundation. They are made in various styles, simple and compound types, the latter being either tandem or cross compound. Among the specialties are independent and belt driven jet condensers and air pumps, surface condensers, feedwater heaters, automatic cut-off governors, and rocking valve engines.

Pneumatic Pumping Machinery.—The Merrill Manufacturing Co., 126 Liberty street, New York, 1895.

We have received from this company a pamphlet treating of the raising of water and other liquids by compressed air, and the advantages of this system. The pneumatic pump for this purpose ranges in capacity from 15 to 100 gallons per minute. The air compressors used with them may be driven by electricity, wind power, steam, gas, water, etc. A design for a railroad pumping plant is given, and tables of gallons of water raised per minute by a given quantity of air, together with much other useful information, completes the catalogue.

Carbolineum Avenarius. The C. A. Manufacturing Co., Austin, Tex.

This is a pamphlet advertising the use of the above compound as a wood preserving fluid. Many testimonials are furnished from users of this means of preserving railroad ties, piles, wharfs, etc. The results, as shown in the pamphlet, are very meager, but seem to indicate a preservative of high value in protecting wood from decay and dry rot, the teredo and other destructive influences.

Train Accidents in the United States in April.

(*Continued from page 328.*)

washout and 16 cars were wrecked. The engineer and fireman were killed.

9th, on New York, Ontario & Western, at Jermyn, Pa., a coal train was derailed at a washout and a brakeman was killed.

12th, on Southern Railway, at Afton, Tenn., a passenger train was derailed by a malicious obstruction and the engine and first 3 cars fell down a bank. Three trainmen were injured.

17th, 3 a. m., on Northeastern Railroad, near Florence, S. C., fast mail train No. 35 was derailed at a washout. One passenger and one trainman were injured. Two sleeping cars took fire from the gas lamps and were burned up.

21st, on Northern Pacific, near Garfield, Wash., a freight train was derailed by running over a cow and the engineer was killed.

And 8 others on 7 roads, involving 6 passenger and 2 freight and other trains.

UNEXPLAINED.

5th, on Bellaire, Zanesville & Cincinnati, at Whigville, O., a passenger train consisting of an engine and one car was derailed near a trestle and the car broke through and fell about 50 ft. The engineer and 3 passengers were killed and the fireman and two passengers were injured.

7th, on Burlington & Missouri River, near Newcastle, Wyo., a car in a freight train was derailed and a brakeman was fatally injured by one of the track rails, which was bent and thrust through the bottom of the caboose.

10th, on Pennsylvania road, near Bordentown, N. J., a passenger train was derailed while running through deep water which had overflowed from the Delaware River, and the passengers had to be taken off in boats.

16th, on Hancock & Calumet, at Dollar Bay, Mich., a passenger train was derailed and several passengers were injured.

20th, on Seaboard Air Line, near Stevers, Va., the engine of a freight train was derailed and wrecked, together with 9 cars. A brakeman was killed.

21st, on Vandalia Line, at St. Elmo, Ill., a freight train was derailed at a switch and the engine and 9 cars were ditched. Two tramps were killed.

And 15 others on 14 roads, involving 1 passenger train and 14 freight trains.

OTHER ACCIDENTS.

1st, 2 a. m., on Boston & Albany, near Becket, Mass., a freight train, descending a steep grade, became uncontrollable and ran at such high speed that the piston rod guides of the locomotive were broken, letting the main rods loose, so that they broke, and damaged the engine badly. The train ran 11 miles, over a very crooked road, in about 9 minutes, but was stopped without damage, except to the engine as stated. It appears that the air brakes, though connected up on a fair number of cars at the front portion of the train, were ineffective, either from careless handling or from worn brake shoes; and the cars of the train, mostly heavily loaded coal cars, were in such condition that the brakemen did not dare to crawl over them; so that the brakes on several of the cars were not set. According to local reports the noise made by the train was so unusual as to awaken sleeping villagers.

3d, on Pennsylvania road, at Altoona, Pa., a gas tank attached to a car of a passenger train exploded, injuring 4 employees and 1 passenger.

13th, on New York Central & Hudson River, at Oswego Junction, N. Y., the roof of a car in a freight train was blown off by a high wind and a man on the ground was injured.

17th, on New York Central & Hudson River, at 116th St. & 4th Ave., New York City a passenger car in a train of the New York, New Haven & Hartford was badly damaged by a derrick which was carelessly allowed to swing against the side of the train. Several passengers were slightly injured.

28th, on Cleveland, Cincinnati, Chicago & St. Louis, near Dayton, O., a car in a circus train was broken by the failure of an axle. There was an elephant in the car and the veracious reporter informs us that the blasts made by the beast were so alarming that the engineer took them for a danger signal and stopped the train.

And 4 others on 4 roads, involving 3 passenger trains and 1 freight train.

A summary will be found in another column.

Car Orders in 1895.

We have collected the items relating to car orders which have been published in these columns, from week to week, since January last, and the tabulation of these orders, given herewith, shows that 21,590 cars have been contracted for so far this year. Besides cars ordered, bids are out now for an additional 3,000 cars, approximately. These figures are for freight cars only. The passenger cars ordered amount to 74, with contracts for 13 more to be given out shortly. We suppose that this represents an investment of over $10,000,000, which is a very important expenditure and worth considering among the influences working to make "times better" for many people.

We have attempted to include in the accompanying detailed statement, all the important car contracts, awarded this year, and much care has been taken to make it complete. It is almost impossible to avoid errors in such a work, however, and we shall be glad to be informed of any that may be discovered by our readers. We have purposely omitted a number of quite small orders, which if included would have added over a hundred cars to the totals.

These figures show an unlooked for improvement in car building this year. In less than five months the total output of the contracting car shops as shown by the records which we have collected, exceeds that of the entire year 1894, by over 5,000 cars. The passenger car output makes a very different comparison, 500 cars having been built in 1894. The comparisons of course are with a year of extraordinary depression. Going back some years, we find from our annual summary of car building that in 1893, we built 51,000 cars, but that also was a slim year for car building. In 1892 the output was more satisfactory, footing up 93,000 freight cars, and that figure is probably more nearly the normal average of cars likely to be added yearly to the freight equipment of railroads in this country. It is less than the number built in each of the two years preceding 1892, the output in 1891 having been over 95,000 freight cars and in 1890 over 103,000.

It appears then that this record of 22,000 cars ordered in five months is only encouraging as indicating a material improvement over extraordinarily dull years; as showing that business is on the mend, that railroads need new equipment and will give orders as soon as they can see their way toward paying for the equipment. An unsatisfactory part of many of the contracts noted in this table from the view of the car builders is in the terms of payment. Few railroads have agreed to make cash payments for the cars they have ordered, and most of the contracts call for long time notes.

Car builders have an unenviable time of it, to have their profits cut down by the largely decreased selling price of cars, and still further cut into by being unable to secure prompt payments for their product. The decrease in cost of cars to railroads has been very considerable in the last few years. They can now secure a more strongly built car, better designed, of greater capacity, with safety appliances, for a less price than was paid within a few years for a 20-ton car without air-brakes or vertical plane couplers.

It is of some interest to know what type of cars are being built and to show the relative proportion of the different classes of cars ordered this year the following statement has been prepared.

	Freight.		Freight.
Refrigerator	1,868	Box (common)	6,680
Ventilated	1,300	Furniture	825
Coal	5,925	Stock	950
Ore	700	Type not specified	2,751
Dump	250		21,591
Platform	250	Passenger	74
Tank	130		
Coke	100		

TECHNICAL.

Manufacturing and Business.

The New York office of the Cleveland Twist Drill Co. has been removed to No. 99 Reade street, in charge of Mr. C. I. Markham. The company will have facilities for showing a complete stock of its twist drills and tools and complete samples of all the company's manufactures. It will carry a large and complete assortment of its tools at this point for the convenience of its eastern trade.

The Standard Paint Co. has recently received another order from the Merchants' Dispatch Transportation Co. for its giant P. & B. insulating paper. This second order is for over half a million square feet and is for insulating the car roofs of the 200 additional refrigerator cars now being built for that line. Early in the year the Standard Paint Co. received an order from this same company for about a million square feet of its insulating paper for the 300 cars ordered in January, so that with this additional order over 1,500,000 sq. ft. of the insulating paper has been furnished to this one line.

The Sellers Manufacturing Co., of Chicago, has been organized with a capital stock of $500,000 to deal in railroad appliances, and particularly to manufacture the splice bar formerly controlled by Morris Sellers & Co., of Chicago. Mr. Morris Sellers is President of the new company, and T. A. Griffin, W. J. Watson and W. S. Brown are among the stockholders.

The Drexel Manufacturing Co. has recently been organized and has taken over from the Drexel Railway Supply Co. a number of its manufactures for the railroad trade. The new company will hereafter handle the Barr vestibule, journal box lids and brake shoe keys formerly sold by the Drexel Railway Supply Co. The latter company will still continue to operate the East Chicago steel plant and the manufacture of the Drexel car coupler, the other manufactures belonging to the new company.

The Duluth Manufacturing Co., which operates the car building plant at Duluth, formerly controlled by the Iron Car Manufacturing Co., has gone into the hands of receivers. The application for the appointment of receivers was made by Robert Lettinger, Superintendent of the Car Co., and the McGuire Manufacturing Co., of Illinois.

The Union Grease Co., of Boston, has added 27 street roads and five steam roads to its list of customers since May 1. Among foreign orders was one from Holland for 20 tons. A sample order was received from Japan to be tried for the new navy there.

The Chattanooga Car & Foundry Co. is filling large orders from the War Department for cast iron cannon, carriages, field plates, etc., to be used in monumenting Chickamauga National Park, and at Antietam. They recently sent four guns and carriages to Chicago for the Confederate monument to be erected there.

The Gold Car Heating Co. is equipping the four postal cars now being built by the Pullman Co. for the Big Four Road with its straight steam system, as applied to the 32 cars built for that company last fall. The Chicago & Eastern Illinois Railroad is now being equipped throughout with the Gold Company's storage system, and the Peoria & Eastern Railroad, which is one of the Big Four lines, is equipping all its cars as rapidly as possible with the Gold Car Heating Company's straight steam system.

Iron and Steel.

The Detroit Steel and Spring Works of Detroit, Mich., is very busy in all departments, and although they are working double turn, employing a full force of men, find it necessary to increase their capacity. Additions to the plant are contemplated to cost in the neighborhood of $30,000.

New Stations and Shops.

The new roundhouse of the Western Pennsylvania, near Herr's Island, Pittsburgh, will have to be torn down and rebuilt.

The passenger station of the Southern Railway at Charlotte, N. C., was burned on May 17, causing a loss of over $30,000, insured. As the passenger station of the Carolina Central, one of the roads of the Seaboard Air Line at Charlotte, was also recently destroyed by fire, it has been suggested that the two companies build a union station instead of erecting two separate buildings, and it is believed that this plan will be followed out.

Interlocking.

The National Switch & Signal Company has the contract for installing a complete interlocking plant at Port Reading, near Bound Brook, N. J. This is a crossing of the Philadelphia & Reading with the Lehigh Valley, and the new machine replaces a pneumatic machine which was erected in 1884.

CAR ORDERS IN 1895.

RAILROAD.	Number.	TYPE.	BUILDER.
Atlanta & West Point	100	ventilated, fruit	St. Charles Car Co.
Armour & Co	500	refrigerator	300 to Wells & French Co.; 200 to Mo. Car & Fdy. Co.
Balto. & Ohio S. W.	300	stock	not awarded.
Buff., Roch. & Pittsburgh	200	coal	Union Car Co.
Boston & Maine	600	200 coal; 200 box; 200 platform	not awarded.
Clev., Cincin., Ch. & St. L.		200 box; 100 box; 150 dump; 300 stock	Indiana Car Co.; Terre Haute Car & Mfg. Co company's shops; Indiana.
" " " " "	3	postal	
" " " " "	4	passenger	Pullman Car Co.
Columbus, H. V. & Toledo	1,000	30-ton gondola	Pullman Car Co.
" " " "	100	side dump coal	Mich.-Peninsular Car Co.
Chic. & So. Bend	50	furniture	not awarded.
Choc., Okla. & Gulf	500	stock	not awarded.
	10	passenger	
Clev., Lorain & Wh	100	coal (60,000 lbs.)	Mich.-Peninsular Car Wks.
Campbell House Car Co	15	comb. box	So. Baltimore Car Wks.
Chic., Pad. & Memphis	200	freight	not awarded.
Central of Georgia	150	freight	railroad shops.
Calif. Fruit T. Co.	200	refrigerator	Wells & French Co.
Cold Blast T. Co.	100	refrigerator	Mo. Car & Fdy. Co.
Ches. & Ohio	100	patent stock	Ensign Mfg. Co.
Chilian Gov't	100	50 refrigerator; 50 stock	Union Car Co.
Duluth & Iron Range	400	ore	300 to Pullman Car Co.; 100 to Duluth Mfg. Co.
Davenport S. R. Co.		tank	Memphis Car & Fdy. Co.
Dold Packing Co.	100	refrigerator	Mo. Car & Fdy. Co.
Del. & Hudson	150	freight	Jackson & Woodin Mfg. Co.
Duluth, Missabe & Nor.	200	ore	Pullman Car Co.
Dela., Lack. & Western	500	coal	Jackson & Woodin Mfg. Co.
Evansville & T. Haute	75	box (50,000 lbs.)	Ohio Falls Car Co.
Farrell & Co., Omaha	30	tank	Memphis Car & Fdy. Co.
Flint, Eddy & Co. (for exp't)	275	coal, platform and box	Bloomsburg Car Co.
G. Fowlers' Sons Co. K. C.	50	freight	not awarded.
Fall Brook Coal Co.	200	coal	not awarded.
K. C. Refrig. Co.	58	refrigerator (34 ft., 60,000 lbs.)	St. Charles Car Co.
K. C. Osceola & Southern	25	gondola	
Ind., Dec. & Western	3	passenger	Pullman Car Co.
Illinois Central	1,000	freight	Haskell & Barker Car. Co.
	300	refrigerator	
K. C. Provision Co	50	refrigerator	not awarded.
Live Poultry T. Co.	50	poultry	Ohio Falls Car Co.
Louisv. & Nashville	950	500 box; 400 gondola; 50 ore	300 to Elliott Car Co.; 650 to Mt. Vernon Mfg. Co.
Monterey Mining Co.	50	ore	Ryan & McDonald.
Merchants Desp. T. Co.	500	36-ft. r frigerator	150 to Mich. Penin. Car Co.; 350 to Union Car Co.
Missouri, Kan & Texas	2,000	800 box; 700 furniture; 500 coal	Mo. Car & Fdy. Co.; Madison Car Co.
Maine Cent	15	passenger	Pullman Car Co.
Memphis F. Frt. Line	600	box	Memphis Car & Fdy Co.
Mobile & Ohio	100	box	Mt. Vernon Mfg. Co.
Miss. R. & Bonne Terre	100	dump	St. Charles Car Co.
Menasha W. W. Co.	10	box	Haskell & Barker Car Co.
Mexican Cent	230	34 feet box	Mt. Vernon Car Co.
Mather Stock Car Co.	500	stock	Indiana Car Co.
N. Y., N. H. & Hartford	16	for electric passenger service	Barney & Smith Car Co.
N. Y. C. & H. R.	3,000	box cars	1,500 to Buffalo Car Mfg. Co.; 1,500 to Mich.-Penin.
Oliver Coke & Furnace Co.	100	coke	Mich.-Peninsular Car Co.
Phila. & Reading	1,000	coal	Pullman Car Co.
Pennsylvania Co	1,000	hopper bottom; gondola	500 to Barney& SmithC.Co.; 100 to Union Car Co.; 400 at Altoona shops.
Plant System	5	passenger	Pullman.
Pittsb. & Lake Erie	500	freight	Michigan-Peninsular.
Phila., R. & New Eng	150	100 coal; 50 furniture	Union Car Co.
Penn. Midland	700	500 coal; 100 box; 100 flat	Murray, Dougal & Co.
Southern Ry	500	ventilated, box	350 to Ohio Falls Car Co.; 150 to Elliott Car Co.
" "	500	coal	Lenoir Car Wks.
" "	10	express	Barney & Smith Car Co.
St. L., A. & T. H.	125	75 furniture; 50 box	Mt. Vernon Car Co.
	760	700 ventilated. fruit; 60 refrigerator	Ensign Mfg Co.
Southern Pacific	18	passenger	Pullman Car Co.
	500	box	
Savannah, Amer. & M	300	platform	not awarded.
Trinity C. & M.	200	100 platform; 100 box	Madison Car Co.
Tex. Midland	66	box, furniture and coal	St. Charles Car Co.
Tol., A., A. & Nor. Mich	560	box	not awarded.
Texas & Pacific	300	box	Mo. Car & Fdy. Co.
Union Tank Line	100	40-ft. tank	company's shops.
Unadilla Valley	10	freight	Carlisle Mfg. Co.
Wheeling & Lake Erie	600	freight	
Wisconsin Central	50	platform	company's shops.

The Projectile Again Ahead.

On May 17, a 13-in. gun was fired at an 18-in. Carnegie plate which had been previously tested on May 1, the tests having been described in these columns. The range was 1,300 yds., the projectile, a Wheeler-Stirling solid steel shot, weighed 1,100 lbs., having an initial velocity of 1,942 ft. per second, and a striking energy of 28,800 ft.-tons. The shot broke the plate into four pieces, and was itself destroyed. The oak backing was broken up, and the pieces of the projectile entered the sand bank in the rear of the plate. This result, it is thought, may influence somewhat the future choice of guns for our battle ships.

A Disinfector for Railroad Cars.

The proper sanitation of railroad cars is a matter that receives in this country far less attention than it deserves. While the best way of disinfecting upholstery, hangings and interior work will be hard to find, and to introduce, the closets may be cheaply and simply purified. The gases from closets are often disagreeably noticeable, especially in the seats near them, while in any case, the air in closed and even in ventilated cars may be laden with disease germs. The Lake Shore & Michigan Southern has for the past year been disinfecting its passenger cars by a device called the "Zenoleum" disinfector, and Mr. A. M. Waitt of that road has expressed himself as highly pleased with the results. He writes that there have been no complaints of disagreeble odors, and further says: "Our cars by the use of this material (zenoleum) have been rendered sweet smelling and clean, and I can take pleasure in recommending the efficiency of your disinfectant to anyone that you may choose to refer to me". This process of disinfecting cars has also been adopted by the Michigan Central, the Cleveland & Detroit Steam Navigation Co., The Grand Rapids & Indiana and other corporations. The disinfectors are made by the A. H. Zenner Co., of 87-89 Shelby street, Detroit, Mich.

The Santa Fe Bulk Express Car.

The Santa Fe Fruit and Refrigerator Line has fitted up a number of cars under the Barton patent for the transportation of deciduous fruits in bulk, which they have designated the "Santa Fe Bulk Fruit Express Line." The fruit is packed in trays, made of slats 12 in. wide, 6 in. deep, and as long as the width of the car, resting on tracks running along the sides of the car, allowing 2½ in. air space between each layer. Each end of the car is fitted up independently of the other, and the trays are fastened in place in the center with a bulkhead. When empty the trays fold up compactly and are stored on the upper track, leaving the car available for general merchandise.

In addition to the claims of improved ventilation and cold air circulation, the owners figure out that the saving to the shippers of cherries and other small fruits will be about as follows: Decrease in weight of packages per car, 2,542 lbs.; Saving in cost of packages (exclusive of freight on packages from box factory to station), $46.25; saving in freight charges on packages per car from Pacific Coast points to Chicago, $31.75; total $78, with an increase in the carrying capacity of each car of 3,328 lbs. of fruit. About the same ratio of saving is figured out for apricots, pears and peaches. In addition to this, a saving is effected in the cost of bracing and stripping rendered necessary in loading with the old style package.

The officers of the Atchison, Topeka & Santa Fe are enthusiastic over the possibilities of the new car, and Manager Davis is preparing to equip additional cars with the device as rapidly as required.

Trolley Wire.

The Mount Holly branch of the Pennsylvania and the Nantasket Beach branch of the New York, New Haven & Hartford, are going ahead rapidly with their electrical equipment. Regular 00 B & S. gage hard drawn trolley wire and stranded weather-proof feeder will be used by the Pennsylvania Railroad Co., but the Nantasket Beach branch is to be equipped with a copper trolley wire of peculiar shape, to give a large surface of contact to the trolley and a convenient method of suspension. John A. Roebling's Sons Co. are making all the wire for both roads, and are about the only concern which has been successful with odd shapes of copper wire in long lengths for this purpose. There are many difficulties to be overcome in the manufacture of trolley wire other than the regular kind, and the Roebling Mill is particularly adapted for such work.

The Brooklyn Bridge Railroad Cables.

In the table herewith is given the latest record of cable service on the New York & Brooklyn Bridge Railway, being up to May 12 last. This includes a record of cable No. 7, removed on that date, which performed a larger service than any other cable heretofore used.

CABLE SERVICE ON THE BRIDGE RAILROAD TO MAY 12, 1895.

Cables in order of service.	State of service.	Term of service. Days.	Total distance hauled. Miles.	Total passengers hauled.	Total ton miles hauled.	Average loads hauled. Tons.	Av. ratio of live to dead load.
No. 1.	Remov'd	1,140	223,329	49,002,442	22,142,706	97.0	6.0
No. 2.	"	607	120,232	47,840,262	25,492,892	212.0	7.3
No. 3.	"	393	82,099	36,941,884	20,395,073	248.4	7.6
No. 4.	"	356	74,111	34,134,409	18,923,469	255.3	7.6
No. 5.	"	520	111,116	53,287,452	33,857,666	304.7	8.3
No. 6.	"	509	109,475	58,071,052	35,149,894	321.1	8.4
No. 7.	"	511	111,136	59,815,950	35,932,894	323.3	8.3
No. 8.	In use.						

Handy Shop Tools.

At the Burlington shops, at Aurora, Ill., are some tools that prove very handy in repairs, and in the construction of locomotives and rolling stock.

In the boiler shop there is a pneumatic rotary machine for drilling and tapping stay bolt holes and screwing in the stay bolts. It is supported by chains and can be easily operated by one workman. An irreversible joint back of the head that holds the drill or tap does away with the necessity of keeping the machine in line with the tool.

In the truck shops there is a pneumatic riveter which greatly facilitates the construction of the trucks. It is of the usual type with a horseshoe frame. A machine for grinding the guides is found in the locomotive repair shops. It has a form similar to a planer, the guides being mounted on the bed and carried beneath an emery wheel.

Something that cannot be classed under the head of shop tools, but which is quite novel, is the arrangement of a boiler, so that the escaping heat from the furnace used to heat the scrap iron passes through the fire-box and flues and generates steam. By this location of the boiler a portion of the heat usually wasted is utilized.

Recent Observations of Wind Velocities.

We give a table of velocities of the wind observed by the United States Weather Bureau at the Post Office Building, Philadelphia, from 1892 to 1894. The equation used was $P = .004\,S\,V^2$; where P is the pressure per sq ft. in pounds, S, the surface in square feet, and V the corrected velocity of wind in miles per hour. The table is from the *Proceedings* of the Engineers' Club of Philadelphia for April. The results were contributed by Mr. E. F. Miller.

Highest velocity in the month of	Occurred in the years of	Velocity recorded by anemometer, M. P. H.	Corrected velocity as per table M. P. H.	Corresponding pressure per sq. ft.
January	1878 and 1885	52	42.2	7 13 lbs.
February	1876, 1880, 1886	48	39.3	6 18 "
March	1888	60	48	9.22 "
April	1879	50	40.8	6.67 "
May	1889	60	48	9 22 "
June	1889	46	37.8	5.72 "
July	1876	40	33 3	4 44 "
August	1893	55	44 4	7 89 "
September	1889	54	43.7	7.64 "
October	1876	75	58.7	13 74 "
November	1873	66	52.3	10.94 "
December	1876	63	50.2	10 08 "

THE SCRAP HEAP.

Notes.

The Baltimore & Ohio has established eight new block signal stations on the Baltimore and Washington Line.

It is reported from Los Angeles that W. H. Thompson has been sentenced to be hung for participation in the train robbery at Roscoe, Cal., several months ago.

The Order of Railway Conductors, at its annual meeting at Atlanta, Ga., last week, voted to appropriate $35,000 for the relief of 180 members who took part in the strike on the Lehigh Valley road in 1893.

The Auditor of the State of Colorado has announced that hereafter he will not allow mileage to legislators and public officers who travel upon railroad passes. His action is based on a recent decision of the State Supreme Court.

The Governor of Minnesota has issued a proclamation intended to throw open to settlement certain lands that were granted to the Hastings & Dakota Railroad about 1870. The railroad went into insolvency and the State sued to quiet the title.

The wharf, freight shed and coaling pier of the Intercolonial Railroad, at Richmond, near Halifax, N. S., were burned on Sunday morning last, together with many loaded cars and 60 head of cattle. The loss is stated in the press dispatches at $250,000.

The general waiting room in the enlarged station of the Pennsylvania Railroad at Broad street, Philadelphia, has a map which is claimed to be the largest in the world. It is painted upon heavy canvas and is fixed upon the north wall of the room. It is 15 ft. wide and 112 ft. 5 in. long. It shows the Pennsylvania lines and their connections, and there are nearly 4,000 names upon it.

Charles J. Searcey, the companion of Morgan in the train robbery at Acquia Creek, Va., last October, has been sentenced to imprisonment for eight years. He pleaded guilty and the jury fixed the term of imprisonment. It appeared on the trial that the state officials had agreed to let Searcey off with a five years' sentence in consideration of his turning state's evidence, but the judge would not recognize the agreement.

The Wells-Fargo Express Company recently made ap-

plication to the receivers of the Atchison, Topeka & Santa Fe for relief under its contract with that road, alleging that it had been demonstrated by the operations of the past year under the contract that it was unjust, the express company being unable to make enough on the Atchison lines to pay the charges required. The receivers applied to Judge Caldwell for instructions, and he gave them permission to negotiate with the express company and report upon such a modification, if any, of the contract as they were willing to make. When the report was filed the express company appeared at the hearing, and, after hearing both sides, the judge stated that in view of the fact that the contract embraced properties not in his hands he preferred that the parties come to a mutual agreement on all points before submitting the matter to him for final decision, stating that if they could not arrive at an agreement he would be inclined to disaffirm the existing contract and let them make a new one. Consequently, the parties have resumed negotiations, and it is probable that a compromise will be arrived at which will be accepted by the court.

New Car Shops for the Illinois Central.

The Illinois Central Railroad will shortly begin the erection of extensive car shops at Burnside, Chicago, the estimated cost being about $500,000. They will be situated north of the company's present shops, on the 160 acre tract of land owned by the company, between Ninety-fifth and Ninety seventh streets, Cottage Grove and South Park avenues.

They will be built of brick and stone, and equipped with the most improved machinery. The plans, which have been prepared by Chief Engineer Wallace, are for five buildings. Four of them will be one story in height and three of them will be 362 ft. long and 160 ft. wide. The fourth will be 502 ft. long and 100 ft. wide. The remaining building will be 254 ft. × 110 ft. The large shop will be used as a planing mill, while the others will be passenger and freight car shops. When the new buildings are finished the old shops at Twenty-seventh street will be abandoned.

Change of Motive Power.

The Norfolk & Ocean View Railroad, owning 7½ miles of railroad between Norfolk, Va., and Ocean View, on Chesapeake Bay, is to be equipped with electric motors. The poles are now being erected and the power-house is to be on the line about midway between Norfolk and Ocean View.

Metropolitan Elevated, Chicago.

On Friday, May 17, the rolling lift bridge of the Metropolitan Elevated Railroad over the Chicago River just north of Van Buren street was completed, and the trains began running into the regular terminal at Franklin street. Prior to this date the Canal street station just west of the river had been used as a terminal. The extensive interlocking plant at Market street, which was installed by the National Switch & Signal Company, was also put in service, and Mr. Henry M. Sperry, the western agent of the company, reports that everything connected with it operated very successfully.

Burning of the Hartford Bridge.

The old highway bridge across the Connecticut River at Hartford was burned on the night of May 17. This ancient bridge was built in 1818, and contained at the time of its destruction some of the original timbers placed in it 77 years ago. It was 970 ft. long, and was built on five stone piers, rising 24 ft. above the water. The structure was roofed over. It was in a very dilapidated condition, and its destruction was a cause for great rejoicing by the people of Hartford, since a new bridge must now be built. Indeed, it has been hinted that it was set afire for this reason. The charter of the company which owned it, prevented the construction of a new bridge while the old one was standing.

Fast Run from Pittsburgh to Chicago.

Pittsburgh papers report that a train of three cars, carrying officers of the Pennsylvania Co., ran from Pittsburgh to Chicago on May 7 in 10 hours, 4 minutes. The distance is 468 miles, making the rate of speed 46.5 miles an hour. There were numerous delays, and the actual running time is said to have been 8½ hours, equal to 55 miles an hour.

The "Scare Element" in a Street Car Fender.

All of the trolley cars in Newark were equipped with fenders on Nov. 1, 1894. Since then only one death has been caused in Orange and three in Newark. The fenders are crude affairs at the best, but they are in every way superior to the makeshifts used in Brooklyn. . . . The best fender, in Newark, as evidenced by results, is a flimsy affair in the form of a couch, extending in front of the dashboard, but it is reinforced by another scoop under the platform, which is supposed to drop to the pavement and pick up anybody who gets under the "sofa" in front. But the unsightly and frail looking structure in advance has saved numerous lives, and the secondary fender has never been called upon to do any work. It is generally agreed in Newark that the "scare element" in the car fenders has been more efficacious than the mechanical construction, and that this would be still further enhanced by painting all of the fenders in the brightest colors procurable. The fender prevents people taking risks. It sticks out in front of the car three or four feet and threatens the shins. Everybody is slightly sensitive about being hit below the knees.—New York *Sun*.

LOCOMOTIVE BUILDING.

The Atlantic & North Carolina Railroad has just received from the Richmond Locomotive Works two new passenger engines for fast service between Goldsboro and Morehead City, N. C.

We have the following particulars of the Missouri, Kansas & Texas order in addition to the facts published by us May 3. On April 27 a contract was closed with the Baldwin Locomotive Works for five mogul and four consolidation locomotives. Shipments of these were made as follows: Two moguls, May 15; one mogul and two consolidations, May 17; two moguls, May 18; two consolidations, May 26.

The moguls have 19-in. × 24-in. cylinders and 56-in. driving wheels, with 4,000-gal. tank. The consolidations have 21-in. × 26-in. cylinders, 56-in. driving wheels, and 4,300-gal. tanks.

Five additional moguls were ordered at the same time from the Brooks Locomotive Works, and four from the Richmond Locomotive Works.

CAR BUILDING.

The Union Car Company at Depew has just received an order for 200 Wickes refrigerator cars from the Merchants Despatch Transportation Co., making 350 of these cars which the Merchants Despatch has ordered from the Union Car Company this year. These orders with the 150 Wickes refrigerator cars recently delivered by the Michigan Peninsular Car Co. makes a total of 500 cars recently ordered by the Merchants Despatch.

The Pullman Palace Car Company has been awarded the contract to build 1,000 coal cars for the Philadelphia & Reading.

The Memphis Car & Foundry Company, Memphis, Tenn., is now working on 200 furniture cars for the Southern Railway. These cars are 40 ft. in length, and are M. C. B. standard for 60,000 lbs.

The South Baltimore Car Works has been given a contract by the Montana Coal & Coke Co. to build 200 large eight-wheel cars, with end gates, for use at lake ports, if necessary.

The Columbus shops of the Pennsylvania are now building a number of new passenger cars for the St. Louis limited, and for two other fast passenger trains running over the Panhandle Railroad.

The Texas & Pacific order has gone to the Missouri Car & Foundry Co. It is for 300 box cars.

The Live Poultry Transportation Co., which has offices in the Rookery Building, Chicago, has recently let a contract to the Ohio Falls Car Manufacturing Co., for 38 additional cars to be used exclusively in the live poultry trade. These cars will have a capacity of 16,000 lbs. each, that is, from 4,000 to 5,000 head of poultry. The cars are 34 ft. 10 in. long inside. The equipments used in addition to that of a common car are the special patent appliances of this company. The cars are without air-brakes or vertical plane couplers. The Live Poultry Transportation Co. at present has in service 150 of these special poultry cars.

BRIDGE BUILDING.

Ashland, Pa.—The grand jury has recommended the erection of a county bridge at this point.

Cleveland, Akron & Columbus.—The Youngstown Bridge Co., Youngstown, O., has been awarded the bridge work to be built by the Cleveland, Akron & Columbus Railroad, consisting of two 91-ft. girder spans on bents across Big Walnut Creek, two 144-ft. spans near Gambier, O., and three 108-ft. spans over the Mohican River. These bridges are to be of steel throughout and built to sustain a consolidation engine and tender, with a maximum weight of 120 tons.

Connellsville, Pa.—The Pennsylvania is building a steel suspension bridge across the Youghiogheny River at this place, to take the place of the wooden one which has been in use since the construction of the road. The material is being furnished by the Pencoyd Iron Works, Philadelphia.

Hensall, Ont.—Tenders addressed to Alexander G. Smillie, Town Clerk, are invited by the council of the Township of Tuckersmith for the erection of bridges, one 80 ft. span and one 90 ft. span.

Hespeler, Ont.—The Grand Trunk Railway Company will build a new bridge over the River Speed at this place.

London, Ont.—The Chief Engineer of the London & Port Stanley Railroad, O. Graydon, is advertising for proposals for the erection of two steel bridges, one over Kettle Creek and one over Mill Creek on the line of that railroad.

New York.—The bill authorizing the construction of a bridge over the East River, between New York and Brooklyn, has been approved by the mayors of the two cities. Governor Morton will probably sign the bill. The two mayors will each appoint three persons from their respective cities, who will, with themselves constitute a commission having charge of the construction of the bridge.

The bridge will cross the river between Broadway, Brooklyn, and Grand street, New York. It will be a suspension bridge, as provided in the bill.

O'Brien's, Ont.—The Waddell Bridge & Engine Co., of Trenton, Ont., have received the contract for the superstructure and substructure of the proposed new bridge at O'Brien's, Ont. The bridge will be of four spans. The two outer spans will be each 100 ft. long and the other spans 69 ft. and 90 ft.

Ottawa, Ont.—The Deschenes Bridge Co. proposes to construct a bridge across the Ottawa River between Britania and Deschenes. One of the promoters is Mr. J. R. Booth, of Ottawa.

Peterboro, Ont.—The Dominion Government will grant $4,000 toward the construction of a drawbridge over the Otonabee River at Rosa. The Ontario Government has also granted $2,500 for the same purpose.

St. John, N. B.—The St. John River Bridge Co. proposes to build four bridges across the St. John River at the following points: Near Claire Station, at St. Hilaire, at Edmundston, and at Leonard's, N. B. The promoters are Messrs. Thos. Malcolm, Duncan Ross, of Edmundston, E. D. Boswell and Roger Ryan.

Sunbury, Pa.—The court has ordered the construction of a bridge over Delaware River in Delaware township.

Warren County, Tenn.—The Warren County Bridge Committee has closed a contract with the Youngstown Bridge Co. for two bridges over Collin's River.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Western Indiana, special, 1½ per cent.

Delaware & Bound Brook, quarterly, 2 per cent., payable May 20.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 28.

Chicago & Northwestern, annual, Chicago, June 6.

Chicago, St. Paul, Minneapolis & Omaha, annual, company's office in Hudson, Wis., June 8.

Manchester & Lawrence, annual, Manchester, N. H., May 31.

Missouri Pacific, special, at St. Louis, Wednesday, June 12. To act upon a proposed issue of bonds to replace the floating indebtedness.

Northern, annual, Phenix Hall, Concord, N. H., on Thursday, May 30.

St Louis, Iron Mountain & Southern, at St. Louis, Wednesday, June 12. The meeting is for the purpose of acting upon a proposed issue of bonds to replace the floating indebtedness.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Mechanical Engineers* will hold its annual meeting at Detroit, Mich., June 25, 26, 27, 28.

The *American Railway Accounting Offices* will hold its seventh annual meeting at Detroit, Mich., commencing Monday, May 29, at 10 o'clock a. m.

The *National Association of Local Freight Agents* will meet in New York City at the Broadway Central Hotel on June 11.

The *Master Car Builders' Association* will hold its annual convention at Thousand Islands, Alexandria Bay, N. Y., commencing June 11.

The *Master Mechanics' Association* will hold its convention at the Thousand Islands, commencing June 17. Applications for rooms for both the M. C. B. and M. M. conventions should be made to J. B. Wistar and Charles W. Crossman, both at Thousand Islands, Alexandria Bay, N. Y.

The *International Railway Congress* will meet at the Imperial Institute, London, England, beginning June 26.

The *American Society of Civil Engineers* will hold its annual convention at Nantasket Beach, commencing June 18.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

Order of Railway Conductors.

The convention of this association was held in Atlanta, Ga., last week. On the 15th the head of the association, Mr. E. E. Clark, was re-elected for two years. Mr. Martin Chancey, of Meadville, O., was elected Secretary, succeeding W. P. Daniels.

Western Railway Club.

At the May meeting of the club, held on Tuesday of this week at the Auditorium Hotel, Chicago, the first discussion was on the subject of car heating. After that the new constitution, which was proposed at the April meeting of the club, came up for action. The annual election of officers was also held at this meeting.

Canadian Society of Civil Engineers

A meeting of the society was held at its rooms in Montreal, on May 23. Mr. E. A. Stone, a member of the Society, read a paper on "Special Track Work for Electric Street Railways." A discussion was also had on the resolution looking to the desirability of a consolidation of the various engineering societies and similar organizations in Canada.

The Civil Engineers' Club of Cleveland.

On May 14 the members of the club made a visit to the Case School of Applied Science. After a few hours spent at that college, the members took supper together and proceeded to the club rooms. The club listened to an interesting lecture by Dr. Dayton C. Miller, upon Polarized Light. It was beautifully illustrated by the aid of the projection polariscope, and subsidiary apparatus.

A pleasant innovation at this evening's meeting was the presence of ladies, some of whom had attended the excursion of the afternoon and the supper afterward.

The Southern and Southwestern Railway Club.

The next meeting of the Southern and Southwestern Railway Club will take place at the Kimball House, Atlanta, Ga., on Thursday, Aug. 15, 1895, at 10 o'clock a. m. The subjects for discussion will be:

(1.) Additional Report of Committee on Draft Sheets, and Discussion of the Subject.

(2.) "Best Sizes of Pipes and Connections for Radiating Results of the Baker Heater; Best Liquid to be Used." Messrs. J. M. Holt and T. S. Floyd.

(3.) "Boiler Washing and Filling with Hot Water; How Best Accomplished." Messrs. John Dempsey, G. D. Harris and J. T. Robinson.

(4.) "Present State of the Art of Kindling Locomotive Fires with Oils." Messrs. W. H. Hudson, W. L. Tracy and P. H. Schreiber.

(5.) "Is There Any Way of Handling Cinders and Clinkers Cheaply by Power, or Automatically, from Ash Pits into Gondolas or on Flats?"

(6.) "The Best and Most Accessible Plan for Applying Air-Brakes to Hopper Gondola Cars Having Straight Chutes."

(7.) "A Durable and Cheap Round-House Floor."

(8.) "Locomotive Boiler Lagging; Most Recent Practice for High Pressure Boilers; Efficiency as Non-Conductor, Cost, Durability, Ease of Application, Ease of Removal and Replacement for Repairs; Fire-Proof Qualities and Influence on External Corrosion."

The last four subjects have no special committees.

American Society of Civil Engineers.

The following is a condensed programme of the convention to be held at the Hotel Pemberton, Boston Harbor (Nantasket Beach), beginning Tuesday, June 18, 1895:

Arrangements for the convention are in the hands of the following committees:

Of the Board of Direction: Desmond Fitzgerald, Chairman; Fayette S. Curtis, Joseph M. Knap.

Local Committee: John R. Freeman, Chairman; S. E. Tinkham, William Jackson, H. Bissell, Geo. F. Swain, Frederic P. Stearns, Albert F. Noyes, Edward W. Howe, Henry D. Woods.

Of the Boston Society of Civil Engineers: Dexter Brackett, Fred Brooks, T. Howard Barnes.

Tuesday, June 18.—The New York, New Haven & Hartford Railroad Company has placed at the disposal of the society a special train of Wagner drawing-room cars from New York direct to the Pemberton, for which there will be no charge either for transportation or for drawing-room seats. The train will leave Grand Central Station, New York, at 12 o'clock, and is expected to arrive at the hotel at about 18 o'clock. In the evening a meeting of the Board of Direction will be held, otherwise this evening will be entirely free.

Wednesday, June 19.—Session of the Convention in the morning for papers. Afternoon an excursion through the Boston parks; in the evening the President will deliver the annual address.

Thursday, June 20.—Two sessions of the Convention for the transaction of the business of the society, one in the morning and the other in the evening. The afternoon will be devoted to excursions by groups.

Friday, June 21.—In the morning a harbor excursion to the Boston Main Drainage Pumping Station at Old Harbor Point; to the Moon Island Reservoirs; to the (North) Metropolitan Sewage Pumping Station on Deer Island. The return to the hotel will be made in time for lunch. Afternoon a session for the presentation and discussion of papers. In the evening, at the hotel, there will either be a banquet, or a reception with dancing, supper, etc.

Saturday, June 22.—Closing session of the Convention. At about 11:30 o'clock the party will leave the Hotel Pemberton by steamer for the Railroad Wharf, East Boston. Lunch will be served on the boat. From East Boston the party will proceed by special train, furnished by the Boston & Maine Railroad, to the Crawford House, White Mountains, passing through North Conway and Crawford Notch, and arriving before dark. For transportation on this day and for the return trip to Boston there will be no charge.

Sunday, June 23.—At the Crawford House. Arrangements have been made which will enable those who desire to make excursions to the top of Mt. Willard or the top of Mt. Washington.

PERSONAL.

—Mr. F. H. McFarland, local Freight Agent of the Chattanooga Southern Railway at Chattanooga, has been appointed Superintendent of the Darien & Western Railroad in Southern Georgia, with office at Darien, Ga.

—Mr. C. P. Huntington, President of the Southern Pacific Railroad and the Pacific Mail Steamship Co., sailed for Europe on the steamship Majestic, this week. He expects to be absent about two months. It is probable that while in London he will confer with the Central Pacific bondholders and stockholders.

—Mr. Thomas C. Carson has recently been appointed the Special Railroad Agent of the Carnegie Steel Co., representing the Carnegie steel interests in the railroad trade of this country, and will have his headquarters at the general offices at Pittsburgh. He was formerly in charge of the Denver office of the Carnegie Company.

—Mr. C. W. Cook has been appointed General Freight Agent of the Cincinnati, Jackson & Mackinaw Railroad, as stated last week. He succeeds in that office Mr. T. C. M. Schindler, who heretofore has had charge of both the freight and passenger departments of the company, and will hereafter continue to act as General Passenger Agent.

—Mr. A. R. Waldin has been presented with a handsome gold watch by the Burlington, Cedar Rapids & Northern Railway as a memento of the night of March 19, 1895, when he saved a train of that road by giving notice of a burning bridge near his home, in Iowa. Mr. Waldin also received from the company a pass over the road for himself and his wife during their lives.

—Mr. G. Clinton Gardner, formerly General Manager of the Ohio River Railroad in West Virginia, is now making a trip to Peru to report upon a projected rail road in that country, for an American syndicate which is interested in coal mines there, and whose plans for the development of the mines include the construction of the railroad from the coast to the mountains.

—Mr. Charles H. Putnam, Assistant Traveling Auditor of the Lake Shore & Michigan Southern road in charge of grain accounts, died last week at his home at Sturgis, Mich., aged 66 years. He had been in the service of the Lake Shore and its predecessor, the Michigan Southern & Northern Indiana road, for 39 years, beginning as station agent at Sturgis, Mich. Mr. Putnam was remarkable for painstaking and faithful attention to every duty assigned to him.

—Mr. Cary A. Wilson, Chief Engineer of the Missouri, Kansas & Texas, has resigned that office, and has been succeeded by Mr. Pelham, who has recently been Chief Engineer of the company's lines in Texas. Mr. Wilson was formerly Chief Engineer of the East Tennessee, Virginia & Georgia, and went to the Missouri, Kansas & Texas in 1893, soon after that company had been reorganized and it had undertaken to develop its property and connect the various divisions.

—Mr. Arthur Mellen Wellington died at his home in New York City on the 16th of this month in the 48th year of his age. He had been for many months unable to do regular work, owing to a serious affection of the kidneys, recovery from which has long seemed to his friends very doubtful. Mr. Wellington had achieved a quite unusual reputation. He was best known as a writer and as a technical editor, but had all his life done more or less engineering work, and even in recent years, after having taken up the regular burden of editorial work, he was often called in consultation; but his reputation rests mostly on his work as a writer. He was born in Waltham, Mass., Dec. 20, 1847; was educated in the Boston Latin School, and was an engineering student in the office of Mr. John B. Henck, of Boston. Twenty-five years ago Henck's "Field Book" was the most important volume in the library of a railroad engineer, and we doubt not that Wellington's career was largely shaped by this early association with Henck. He was for several years engaged in railroad work, his most important service up to 1881 having been as Assistant Engineer on the New York, Pennsylvania & Ohio. In 1881 he went to Mexico to take charge of location on the Mexican National Railroad, and later entered the service of the Mexican Central. His work in that country was chiefly in location. He located a line from Vera Cruz to the City of Mexico, which was never built, and located and revised a line from Mexico to Guadalajara, which was built. In 1884 he returned to the United States and became Associate Editor on the *Railroad Gazette*, which place he occupied until the end of 1886, when he went to *Engineering News* as one of the proprietors and editors. His most important literary work outside of the columns of these journals is the "Economic Theory of Railway Location." This was first published as a series of articles in the *Railroad Gazette*, and was reprinted in a volume and published by the *Railroad Gazette* in 1877. During his connection with this journal he gathered the material for a revised edition of that work which was published in 1887. The revised edition was really an entire rewriting with great amplification of the early edition, and from the fact that it formulated certain principles which had never before been widely recognized, or which if recognized had never been formally expressed and demonstrated, and from the further fact that the volume contained a great mass of information, in all of which it was quite unique in railroad literature, it speedily took a very important place, and has been widely used as a book of reference, and to some extent as a text book.

Another important piece of literary work that he did was the revision of the "Car Builders' Dictionary," which he did in 1887, for the *Railroad Gazette*, the publishers of the work. In 1874 he published a useful and successful set of diagrams for the computation of earthwork, and he contributed a number of important papers to the Transactions of the American Society of Civil Engineers, of which society he was a member. He was also a member of the Institution of Civil Engineers, the American Society of Mechanical Engineers, the Canadian Society of Civil Engineers and the Engineers' Club, of New York.

One of the most important characteristics of Mr. Wellington's mind was his fertility and suggestiveness. In these particulars he was original and bold and really useful in the world. The great value of his work on Location is in its suggestions of the ways of approaching any given case of location, rather than in its bold effort to generalize location into an exact science; and the work has undoubtedly had a stimulating influence on many minds. Mr. Wellington was a man of a good deal more than average intellectual gifts. He had high analytical powers, was inventive, was a pretty good mathematician, and above all he had tremendous energy. He had the capacity for throwing himself into his work with wonderful zeal and pertinacity. In his power of work and his faculty for absorbing interest in the work in hand lay his greatest strength, and it is probably true that his habit of unremitting intellectual work and his disregard of his need for exercise and amusement and repose were the direct causes of his untimely death.

ELECTIONS AND APPOINTMENTS.

Denison & Wichita Valley.—The annual meeting of the stockholders was held at Denison, Tex., on May 14, and the following officers and directors were re-elected: W. B. Munson, of Denison, President; W. S. Nevins, Secretary and Treasurer; R. C. Foster, Dr. J. C. Field, H. C. Rouse, T. C. Purdy and J. T. Munson, directors.

Flint & Pere Marquette.—At the annual meeting of the stockholders last week, the old board of directors was re-elected except that R. B. Dodson, New York, of Fahnestock & Co., was elected in place of F. Morrison, deceased.

Georgia Railroad & Banking Co.—The annual meeting of the stockholders of the Georgia Railroad & Banking Co. was held at Savannah, May 8. The board of directors elected May 9, 1894, were unanimously chosen again, and are as follows: Charles H. Phinizy, President; H. H. Hickman, J. H. Alexander, Thomas W. Coskery, Leonard Phinizy, William E. McCoy, Jacob Phinizy and William A. Latimer, of Augusta, Ga.; A. W. Calhoun, R. D. Spalding, Atlanta, Ga.; N. L. Hutchinson, Lawrenceville, Ga.: Joel A. Billups, Madison, Ga.; H. D. McDaniel, Monroe, Ga.; William M. Reese, Washington, Ga.; G. A. Speer, LaGrange, Ga.; W. W. Thomas and James E. White, Athens, Ga.

Gulf & Interstate.—The annual meeting of the Gulf & Interstate Railroad of Texas was held at Galveston, Tex., May 9, and the following directors elected: Leon Blume, N. Weeks, Edward Nemandie, Fox Winnie, W. C. Teter, C. Jones, W. C. Jones, L. P. Featherstone and Noah Allen.

New York & Harlem.—The annual meeting of the stockholders of the company was held at the Grand Central Station, New York City, on May 21. The old Board of Directors, with one exception, was re-elected. John E. Burrill was succeeded by Edward V. W. Rossiter. The names of the present board are Cornelius Vanderbilt, William K. Vanderbilt, Frederick W. Vanderbilt, Samuel F. Barger, Chauncey M. Depew, Charles C. Clarke, John B. Dutcher, Francis P. Freeman, Samuel D. Babcock, Alfred Van Santvoord, Robert Schell William H. Robertson and Edward V. W. Rossiter.

Ohio River.—At the annual meeting of the stockholders, held at Parkersburg, on May 16, the following Directors were elected: W. P. Thompson, New York; E. W. Clark, Philadelphia; R. H. Browse, St. Mary's, W. Va.; Joseph B. Neal, G. A. Burt, B. D. Spilman, Johnson N. Camden and W. N. Chancellor, Parkersburg, W. Va.; Frank J. Hearne, Wheeling, W. Va.; Ely Ensign, Huntington, W. Va.: H. H. Rogers, Charles M. Pratt and C. U. Harkness, New York; S. W. Calton, Jr., Philadelphia, Pa. The directors organized by electing W. P. Thompson, President; George A. Burt, Vice-President and General Manager; W. N. Trecar, Treasurer.

Peoria & Pekin Union.—J. P. Ramsey has been appointed engineer of maintenance of way on the Peoria & Pekin Union.

Rio Grande Western.—George Barclay Moffat has been elected a director of the railroad to fill the vacancy caused by the death of J. D. Potts.

San Pete Valley.—The annual meeting of the stockholders of the company was held at Nephi, Utah, last week. The election of the board of directors resulted as follows: Theodore Bruback; President; J. B. Blair, Vice-President; Charles Morrison, George Cullins, Halbert S. Kerr and Captain T. C. Bailey, Directors. S. T. Pearson was re-elected Secretary.

Sherman, Shreveport & Southern.—The following officers were elected at the annual meeting at Greenville, Tex., on May 14. W. B. Munson, President; F. H. King, Vice-President; H. N. Marache, Secretary and Treasurer; C. G. Hedge, Assistant Secretary and Treasurer; H. W. Poor, chairman of the board; Simon Sterne, General Counsel; F. W Fratt, General Manager and Chief Engineer.

Southern.—J. W. Morrow has been appointed auditor of disbursements, with office at Washington, D. C. All labor and material reports, pay rolls, vouchers, bills and correspondence relating thereto are to be addressed to him.

Utah, Nevada & California.—The annual meeting of the stockholders was held at Salt Lake City last week, and resulted in the re-election of the old directors. Francis Tiernan is President; R. S. Walker, of Topeka, Kan., Vice-President; Frank Harris, Second Vice-President; John J. Stewart, Secretary; E. I. Thorn, Treasurer, and S. W. Morrison and Edward Merrill additional directors. This company was organized in 1889 to build a road from Salt Lake to either Los Angeles or San Diego. No work has ever been done on construction.

Valley Terminal.—At a meeting at Appleton, Wis., the following directors were chosen by this new company: J. H. McIntyre, Niagara Falls; George E. Green, Binghamton, N. Y.; A. L. Allen, Chicago; Joseph Taylor, Detroit; John M. Baer and William B. Pelton, Appleton, Wis. The officers are: President, John McIntyre; Vice-President, George E. Green; Secretary, W. B. Pelton; Treasurer, Joseph Taylor; Attorney, Abel L. Allen.

RAILROAD CONSTRUCTION,
Incorporations, Surveys, Etc.

Atlantic & Lake Superior.—The promoters of the railroad have signed a contract with Mr. W. G. Reid, the builder of the United Counties Railway, in Quebec, and a well-known railroad contractor of Montreal, for the grading, track laying and ballasting of 115 miles from Sorel to Point Levis. There are four heavy bridges to be built over the Richelieu, Yamaska, St. Francis and Nicolet rivers, which it is said will cost about $100,000 each. There are also a number of smaller bridges including one at Becancourt. Mr. Reid has let a sub-contract to Thomas Rogers for 10 miles, another 15 miles in length, between St. Gregoire and Gentilly, to William Daly, of Montreal, and L. Fosbrooke, of Sorel. It is expected that the entire line will be sub-let this month. The contract for fencing from Point Levis westward has been awarded to James McCarthy, civil engineer and contractor, of Montreal. Mr. Charles N. Armstrong, the General Manager, has again left Montreal for London.

Batavia & Northern.—A certificate of consolidation of the Batavia & Northern Railroad Company with the International & Oak Orchard Harbor Railroad was filed with the Secretary of State, in Albany, this week. The new road is the Batavia & Northern Railroad Company, with a capital of $500,000. The directors are George A. Wingate, Jacob Cole, William H. Haggard, of Brooklyn; Robert Avery, James H. Cox, of New York City; D. S. Beckwith and Charles E. Hart, of Albion; Nelson Bogue and Oren C. Steele, of Batavia. The project is for a line from Batavia, north to a point on Lake Ontario, near Oak Orchard Harbor, about 28 miles. General Avery is president of the company, which has offices at 45 Broadway, New York.

Charleston, Clendennin & Sutton.—D. Minotti has been awarded the contract for all the stone work and ballast on a 14-mile section of the new road, beginning at Syracuse, 36 miles from Charleston, W. Va., and extending to Clay Court House. The grading is far enough along to begin the stone work on this section. There are quite a number of bridge foundations, and over 20 stone culverts in the contract.

Clarksburg & Ohio River.—At the election held in Lincoln, Elsworth and McElroy districts, Tyler County, W. Va., to decide upon the question of subscribing $25,000, $20,000 and $15,000 respectively to the Clarksburg & Ohio River Short Line, the proposition carried by a strong majority. The Board of Trade of Sistersville, Tyler County, on the Ohio River, has pledged itself to furnish free right of way and terminal facilities in that city.

Denver, Leadville & Gunnison.—The Alpine tunnel will be opened and trains running through to Gunnison, Col., by June 10. The opening of the line over the Continental divide ought to materially add to the revenues of the road this summer as a number of mines can now be operated at a profit.

Glen Grace, Lower Loup Creek and Deep Water.—This railroad company secured a charter in West Virginia last week to build a standard gage road from Glen Grace, Fayette County, on Upper Loup Creek, along Lower Loup Creek, crossing the Kanawha River, to form a junction with the Kanawha & Michigan Railroad. The road will secure for the Kanawha & Michigan road, a supply of the coal peculiar to the Loup Creek region for its lake trade, there now being no road hauling these grades of fuel to the Lake Erie ports. The incorporators are: J. M. Richards, of Oakhill; John E. Preston, Miss Jennie Price and Miss Maggie Price, of Lewisburg; J. W. Davis, of Coffman, and S. L. Price, of Frankford, Md., as incorporators.

Kish-Wau-Kee Mineral Springs.—This company was incorporated May 15, at Harrisburg, to build a road from Big Shanty, McKean County Pa., to Pierce Camp in the same county, a distance of five miles. The capital stock is $50,000; and James Pierce, Boston, Mass., President; J. R. Droney, B. M. Gailey, T. F. Mullen and others of Bradford, Pa., Directors.

Lancaster & Hamden.—Col. William H. Stevenson, formerly Superintendent of the New York, New Haven & Hartford Railroad and President of the Housatonic and other New England roads, has become connected with this road, now being constructed between Columbus and Wellston, O. He is forming a syndicate to complete the road, which will furnish an outlet from the Jackson coal fields to the Great Lakes, via roads leading north from Columbus. It is proposed to extend the line from Wellston or McArthur southward to a point on the Ohio River opposite Huntington, W. Va., or Ashland, Ky., having in view the reaching, via the Big Sandy road, of the deposits of cannel and coking coals in Eastern Kentucky and West Virginia. It is expected that the line between Columbus and Wellston will be completed during the summer. It has been partly graded, and a portion of the line built by E. P. Buell & Co. some few years ago is in operation.

Long Island.—Hawman Brothers, of Reading, Pa., who have been engaged since last summer in constructing the extension of the North Division of the Long Island Railroad beyond Port Jefferson, completed the work last week to Wading River and have now removed their outfit to Reading, Pa. This extension is 11 miles long.

Louisville & Nashville.—The contract for building the Coosada branch in North Alabama has been let to J. W. Worthington & Co., of Birmingham, Ala. The branch will be about 15 miles long, and will extend from a point on the main line of the Louisville & Nashville, a short distance below Coosada, and some miles north of Montgomery, to the mines at Prattville.

Mexican Roads.—A dispatch from Chihuahua, Mex., says that the McCormick Mower & Reaper Co., of Chicago, and Enrique Creel, a banker of Chihuahua, Mex., have obtained a concession from the government for a railroad from Chihuahua to the Ocampo mining district. The government gives the line a cash subsidy of $8,000 per mile. Two preliminary surveys of the road have been made, and it must be completed within two years.

Middle Tennessee & Alabama.—It is reported that the contract has been let to complete this railroad from Decatur, Ala., to Shelbyville, Tenn. The line is 78 miles long, all graded and track is laid for 47 miles.

Monongahela River.—At a joint meeting of the directors of the Monongahela River Railroad, and the Monongah Coal & Coke Co., held in Fairmont, W. Va., last week, it was decided to begin at once upon the plans for a railroad to begin at a point on the Monongahela River Railroad, and extend to the Ohio river and the Ohio River Railroad at a point near Sistersville or New Martinsville, W. Va. The three companies are under the same management. The plan is to put the Fairmont coal region into more direct connection with Cincinnati, the Ohio River, the lake trade and the western markets. Col. J. A. Flickinger and Capt. E. R. Curtis, the chief engineers of the Ohio River and Monongahela River roads, respectively, were at the meeting. There judgment was that the road should follow either Ten-Mile Creek or Bingammon Creek. They were instructed to proceed at once with the surveys and preliminaries, and were given to understand that it was desirable to have the contracts let and work begun by July 1. The routes have all been repeatedly surveyed.

Northern Pacific.—Reports of an alliance of some sort between the Great Northern and Northern Pacific companies have been published for a week or so, but nothing which seemed to be authentic was published until Monday of this week, when some particulars of the arrangement being considered were given out, though no official announcement has yet been made, and the consummation of the plan seems still in doubt. According to this plan the Northern Pacific will be foreclosed, and the Great Northern will guarantee the new bonds, receiving half of the stock of the company to be formed. Mr. Hill, President of the Great Northern, will be President of the new company. Mr. Hill last week returned to New York from London, and admitted that while in Europe he had consulted with representatives of the foreign interests of the Northern Pacific, and that he had agreed to certain propositions for the control of the Northern Pacific. The present negotiations were begun by the General Reorganization Committee of the Northern Pacific, of which Mr. E. D. Adams is chairman. That committee represents the German bondholders who own a majority of the bonds. The committee has recured deposits of a majority of each of the Northern Pacific bond issues and it is believed that the assent of the Deutsche Bank will be given to the contemplated agreement. Mr. Adams is now in Berlin in conference with this interest. The general outline of the plan now discussed, as given in a dispatch from Berlin, provides for foreclosure as already stated and the formation of a new one under a special charter. The new company will issue $200,000,000 bonds and $100,000,000 of stock. The bonds will be secured by a mortgage on the old Northern Pacific system, including the St. Paul & Northern Pacific, and will bear interest partly at 4 per cent and partly at 3 per cent. Of these bonds enough will be reserved to replace the present first mortgage bonds and $30,000,000 will be reserved to acquire independent branch roads and for new construction. The rumor is that the Great Northern shall guarantee unconditionally the principal and interest of these bonds by endorsing each bond, receiving in return for this half the stock of the new company. It is intended to give Northern Pacific seconds 112½ per cent. in new fours, the third mortgage par in new threes and 25 per cent. in stock, and the consols 50 per cent. in new threes and 30 per cent. in stock. The overdue coupons on the seconds are to be paid in cash at 5 per cent.; overdue coupons on the thirds in cash at 4 per cent., and the overdue coupons on the consols at 2½ per cent. in new 3 per cent. bonds. The floating debt is to be paid by an assessment of about $11,000,000 on the old stock.

Pickens Lumber Co.—This company has determined to build a railroad nine miles in length, from Pickens, Randolph County, W. Va., to Mingo, in the same county. The road is for the primary purpose of carrying logs from a timber tract of the company to the mills, but a proposition is under consideration to open the line to general traffic, provided the county gives a free right of way. This proposition will probably be accepted. It is the intention to begin work about Jan. 15, so as to have the road completed by the time the Pickens & Addison line is opened.

Rio Grande Branch Line.—This company was incorporated recently in Denver with a capital stock of $750,000. The incorporators are officials of the Denver & Rio Grande Railroad, whose purpose is to build short branches as follows: Boaz, Las Animus County west; Apishapa up the valley through Cuchara pass; Barnes to Road canon; Silvia southwest; Trinidad up the Purgatoire to San Francisco Pass; and branches leading from these several lines—all for the purpose of opening up coal lands in Las Animas County. The directors are: George Coppell and Richard T. Wilson, of New York; J. Lowber Welsh, of Philadelphia; E. T. Jeffery, A. S. Hughes, H. M. Rogers and E. D. Wolcott, of Denver.

Rockaway Valley.—A number of residents of Somerville, N. J., including G. A. Dilts, W. H. Long, John Anderson, George V. Vanderveer, Frederick Vandeveer, George W. Cooper, Charles S. Voorhees, and Wilson J. Rouser, are planning to extend the Rockaway Valley Railway, from the present terminus at Watnong to Morristown, N. J., a distance of only a few miles, but through a hilly country.

Santa Fe & Cochiti.—Incorporated in New Mexico to build a line from Santa Fe to the heart of the Cochiti mining district, a distance of 35 miles. The incorporators are: Alexander H. Handlan, Jr., and Thomas W. Murray, of St. Louis, Mo.; Levi Ellis, New York; James H. Purdy, Herman Claussen, E. H. Bergman and Sam Elliot, of Santa Fe. The capital is $250,000, of which $35,000 has been subscribed by the incorporators. In connection with this company, another incorporation was made of the Rio Grande Electric Power & Irrigation Co. The construction of two dams is contemplated by this concern to furnish power and water supply for irrigation purposes.

Southern California.—Citizens of the northern part of San Diego County have been working some years to secure the rebuilding of the Temecula railroad, formerly running through Temecula Canyon and connecting Riverside and San Diego. Lately meetings have been held at Oceanside and Fallbrook, and steps have been taken to interest the officials of the Southern California road. The company now operates a branch from the ocean side at Los Angeles junction following the Santa Margarita River for some distance, but there is a gap between the terminus of this gap and Temecula station. It is said that a project is being discussed to extend the Temecula road southward to Buena Vista on the present branch from Oceanside to Escondido, which would result in the control of the entire product of the great Escondido Valley, where important irrigating works have just been completed.

GENERAL RAILROAD NEWS.

Central Washington.—Judge Hanford, of the United States Court, at St. Paul, has appointed Leverett S. Miller, of St. Paul, and C. P. Chamberlain, of Spokane, receivers of the Central Washington branch of the Northern Pacific road. The appointment is made on petition of a majority of the bondholders. The appointment is temporary, a motion to make it permanent being made returnable Sept. 9. It is made discretionary with the trusteee whether the present lease shall be continued. The line was built several years ago, through the Walla Walla wheat growing district in Eastern Washington, and is about 110 miles long.

Kentucky & Indiana Bridge Co.—The Baltimore & Ohio Southwestern Railroad Company has purchased 213 terminal bonds out of 400, of the Kentucky & Indiana Bridge Co. at 70, thereby giving it a controlling interest. There is no doubt that the road will purchase the bridge property as soon as the Court orders it sold.

Savannah, Americus & Montgomery.—This railroad was sold in foreclosure proceedings at Americus, Ga., on May 17. The old Americus, Preston & Lumpkin, from Americus to Lumpkin, Ga., was sold for $200,000. The road from Americus to Abbeville and from Lumpkin to Louvale, Ala., was sold for $500,000; from Lyons to Abbeville and from Louvale to Montgomery for $1,000,000, a total of $1,700,000 for the continuous line from Lyons to Montgomery. These divisions in the sale were on account of the different issues of bonds issued as the road was being built. The road was then offered as a whole and bid in for $1,800,000 the minimum price fixed by the court, by J. W. Middendorf of Baltimore, J. Skelton Williams of Richmond, a committee of bondholders. The Albany, Florida & Northern from Albany to Cordele was sold to W. F. S. Hambleton, L. S. Bent, and H. B. Talmage, for $200,000. It is said that the new management will take steps promptly to enter Savannah, either by building an independent line from Lyons or by getting control of the Central's line from that place.

TRAFFIC.

Traffic Notes.

The midnight train eastward on the Lake Shore & Michigan Southern now starts from Chicago at 2:45 a. m. instead of 11:30 p. m., running enough faster to reach Toledo at 9 a. m. the same as before.

The Mobile & Ohio has reduced freight rates on grain from St. Louis and Cairo to the Southern States 5 cents per 100 lbs. It is stated that this action was taken to meet the competition of the Illinois Central.

The Union Pacific, Denver & Gulf expects to transport an unusally large number of cattle fram Texas and Mexico to Wyoming this season. It is said that contracts have already been made for carrying 170,000 head.

Mr. G. J. Kindel, one of the complainants before the Interstate Commerce Commission at its recent session in Denver, announces that he has received notice that the rate to the Pacific Coast on his manufactures has been reduced 66⅔ per cent.

The saw mills at Stillwater, Minn., are now receiving large quantities of logs by rail from Hinckley, Minn., 76 miles, the Brennan Lumber Co., of the latter place, having decided to dispose of its timber in this way instead of rebuilding its mills, which were burned in the great fire at that place last summer. It is expected that 13,000,000 ft. will be shipped in this way the present season.

Galveston Traffic.

Recent soundings on the bar at Galveston, Tex., show 19½ ft. of water at high tide, which is believed to indicate a draught of 18 ft. at mean low tide. The Spanish steamer Vivina, loaded with 8,526 bales of cotton, consigned to Liverpool, passed out April 30, drawing 17 ft. 7 in., which is the greatest depth thus far recorded. On May 7 the steamship Crown passed over the bar, drawing 17 ft. 3 in., loaded with oil cake and cotton consigned to Hamburg. Galveston merchants and representatives of the railroads at that port see in these figures great and increased prospective tonnage for the port, as it is stated that the dockage charges there are much below those of any other port. The government is still at work dredging on the bar and still more favorable reports are looked for soon.

A comparison of the number of vessels clearing from Galveston for the port seasons of 1894–5, 1893–4 and 1892–3 shows the following:

	1894–5.	1893–4.	1892–3.
Foreign	245	164	169
Coastwise	207	188	100
Total	452	352	269

The net tonnage at the port for the season 1894–5 was 622,097 tons, made up in part of 1,607,255 bales cotton, 201,463 tons cotton seed oil cake, 2,977,647 lbs. wool. A comparison of the net tonnage for the month of January, 1893, '94 and '95 shows the large increase in business, as follows:

January,	1893	46,021 tons.
"	1894	61,714 "
"	1895	114,377 "

Texas Rates.

At the meeting of the Southwestern Traffic Association held in St. Louis last week, an amicable arrangement was reached regarding Texas freight rates, which will for the present, it is expected, relieve the threatening rate situation in that state. The trouble grew out of a demand by the merchants of Dallas and Fort Worth made upon the state railroad commissioners that they cause the rates from St. Louis to Dallas, Fort Worth and other interior points to be equalized with those in effect to Houston and Galveston, which are considerably lower on account of water competition to Galveston. The commissioners, following out their well-known custom, at once ordered the roads to readjust the rates, or they would proceed to make some rates to suit themselves. The Texas & Pacific showed an inclination to at once comply, and gave notice of withdrawal from the Southwestern Traffic Association. The result of the meeting was an agreement to make some advance in the rates to Houston and Galveston and reductions in rates to northern Texas jobbing points, coupled with a resolution to maintain all rates for the present. This action was taken in the hope that the roads might be able to convince the complainants and the Commission that no advantage would accrue to the jobbers at North Texas points by reducing rates from St. Louis, as it would create such a disparity in rates frrom St. Louis to Galveston and Southern Texas points as to cause the St. Louis merchants to complain and the result would be only a general reduction of rates throughout the state, with no benefit to the shippers, but an enormous loss to the railroads. It is understood that the Texas & Pacific will suspend its notice of withdrawal from the association for the present. The representatives of the railroads are by no means confident, however, that they have succeeded in pacifying the Commission, or that, in view of the well known attitude of some of the members of the Board, they will be able to convince them that the proposed reductions will not produce the results which the complainants allege would follow.

Some Figures of Chicago Lumber Traffic.

Col. T. K. Edwards, lumber agent of the Illinois Central, has kindly furnished the *Lumberman* the following figures, showing receipts and shipments in feet for the year 1894, by seven of the railroads leading out of Chicago mainly in a southerly direction:

	Receipts.	Shipments
Chicago & Erie	15,694,000	14,477,000
Wabash	13 799,000	29,187,000
Chicago & Eastern Illinois	63,957,000	58,858,000
Chicago & Alton	11.527.000	27,665,000
Chicago, Burlington & Quincy	28,324,000	81,541,000
Chicago, Rock Island & Pacific	2,673,000	70,668,000
Illinois Central	115.552,000	72,487,000
Total	251,526,000	354.483,000

These roads bring to Chicago mainly yellow pine, cypress and the hard woods, but carry out mainly northern pine. It will be seen that shipments considerably exceed receipts, the excess on the seven roads being 102,957,000 ft. The Illinois Central, the Chicago & Eastern Illinois and the Chicago & Erie bring into this market more than they carry out. The Illinois Central heads the list of intakers, with its 115,552,000 ft. This is the great yellow pine and cypress route, and is also a large carrier of hardwoods. It can load with lumber both ways to a degree characteristic of few railways. It is estimated that 40 per cent. of the lumber reaching this market over the seven railroads listed is yellow pine, or 100,610,400 ft. This seems like a comparatively small amount, but the yellow pine trade north of the Ohio River is but in its infancy, and it is yet far from supplanting northern pine, which is consumed in this city and suburbs to the amount of fully 1,000,000,000 a year, and probably more.

Deducting yellow pine receipts we see that the seven roads brought to this market over 150,000,000 ft. of hardwoods, with a percentage of cypress. Since these lines are heavy hardwood lumber carriers, and probably convey to this city two-thirds of all the hardwood which arrives here, we can get some idea of the extent of the hardwood trade of this city. Yet, after the entire exhibit has been analyzed, we can see that white pine is still the unconquered king of this market.—*Northwestern Lumberman.*

Chicago Traffic Matters.

CHICAGO, May 22, 1895.

Lake rates broke sharply the middle of last week, but recovered and are strong again. Grain shipments reported for the week are: Wheat, 839,000 bush.; corn, 861,518 bush.; oats, 756,927 bush.; flour, 4,590 bbls., 14,564 sacks.

The passenger men here are somewhat apprehensive that the fight between the Trunk Lines and the Canadian Pacific may upset their immigrant agreement by causing the Canadian Pacific to withdraw from all association affiliations west of the Soo so as to be in a position to make a stronger fight at New York. On the other hand, it is questionable whether this may not in the end prove a good thing. If, as is reported, the Great Northern and Northern Pacific interests are to be harmonized, President Hill will be more likely to feel inclined to co-operate with the other trans-continental lines if the Canadian Pacific is left out of the agreement, as he has all along objected to the concessions which were given that line to induce it to become a member of the Western agreement.

Chicago grain commission men do not look with favor upon the failure of the Trunk Lines to reach an agreement with the Western lines for prorating on lake and rail business passing through this city. They say that the result of the action taken in New York will be to force all through grain shipments via the lower Mississippi River gateways and to New Orleans and Newport News. Grain dealers naturally come to this market on account of the reputation of the grain inspection here, and commission men claim that the inspection here will offset an increased rate through Chicago of about two cents a bushel, but when the discrimination is more than that they are powerless to bring the grain to Chicago elevators. They freely predict that the new management of the Grand Trunk will upset the eastbound agreement from here and once more step in and help them out. I think it is more probable, however, that the Central Traffic lines will become restive as they see this business going south and will insist that their Eastern connections reconsider their determination not to pro rate via Chicago.

The movement of dairy products via St. Louis continues, owing to the low rates prevailing via that point. Notwithstanding an agreement to restore rates on the 20th, it is believed that some of the lines had out contracts extending considerably beyond that date which are still operative.

At a meeting of Western Freight Association lines, held last week, it was agreed to advance rates on packing house product from interior points in Iowa to Mississippi River points, 1½ cents per 100 lbs. A reduction was authorized in rates on wheat from Chicago to southwestern Missouri River points, to 13½ cents per 100 lbs., and from St. Louis to same points, to 8½ cents, a reduction of nearly 50 per cent., effective until June 30, on account of the necessity for shipping wheat back to producing points, owing to a shortage at Missouri River points.

The shipments of eastbound freight, not including live stock, from Chicago, by all the lines for the week ending May 18, amounted to 40,323 tons, against 43,931 tons during the preceding week, a decrease of 3,608 tons, and against 47,523 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	WEEK TO MAY 18.		WEEK TO MAY 11.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	2,775	6.8	4,348	9.9
Wabash	4,447	11.0	2,724	6.2
Lake Shore & Mich. South.	4,627	11.5	6,732	15.4
Pitts., Ft. Wayne & Chicago	5,912	14.7	5,607	12.7
Pitts., Cin., Chi. & St. Louis.	5,196	12.9	5 761	13.1
Baltimore & Ohio	3,609	9.0	2,653	6.0
Chicago & Grand Trunk	3,452	8.5	3,597	8.2
New York, Chic. & St. Louis	4,026	10.0	3,788	8.6
Chicago & Erie	4,213	10.5	6,949	15.8
C., C., C. & St. Louis	2,066	5.1	1,772	4.1
Totals	40,323	100.0	43,931	100.0

Of the above shipments 1,792 tons were flour, 14,782 tons grain and mill stuff, 6,783 tons cured meats, 7,595 tons dressed beef, 1,547 tons butter, 1,204 tons hides, and 5,563 tons lumber. The three Vanderbilt lines carried 28.3 per cent., the two Pennsylvania lines 27.6 per cent.